Plastics

DEALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS

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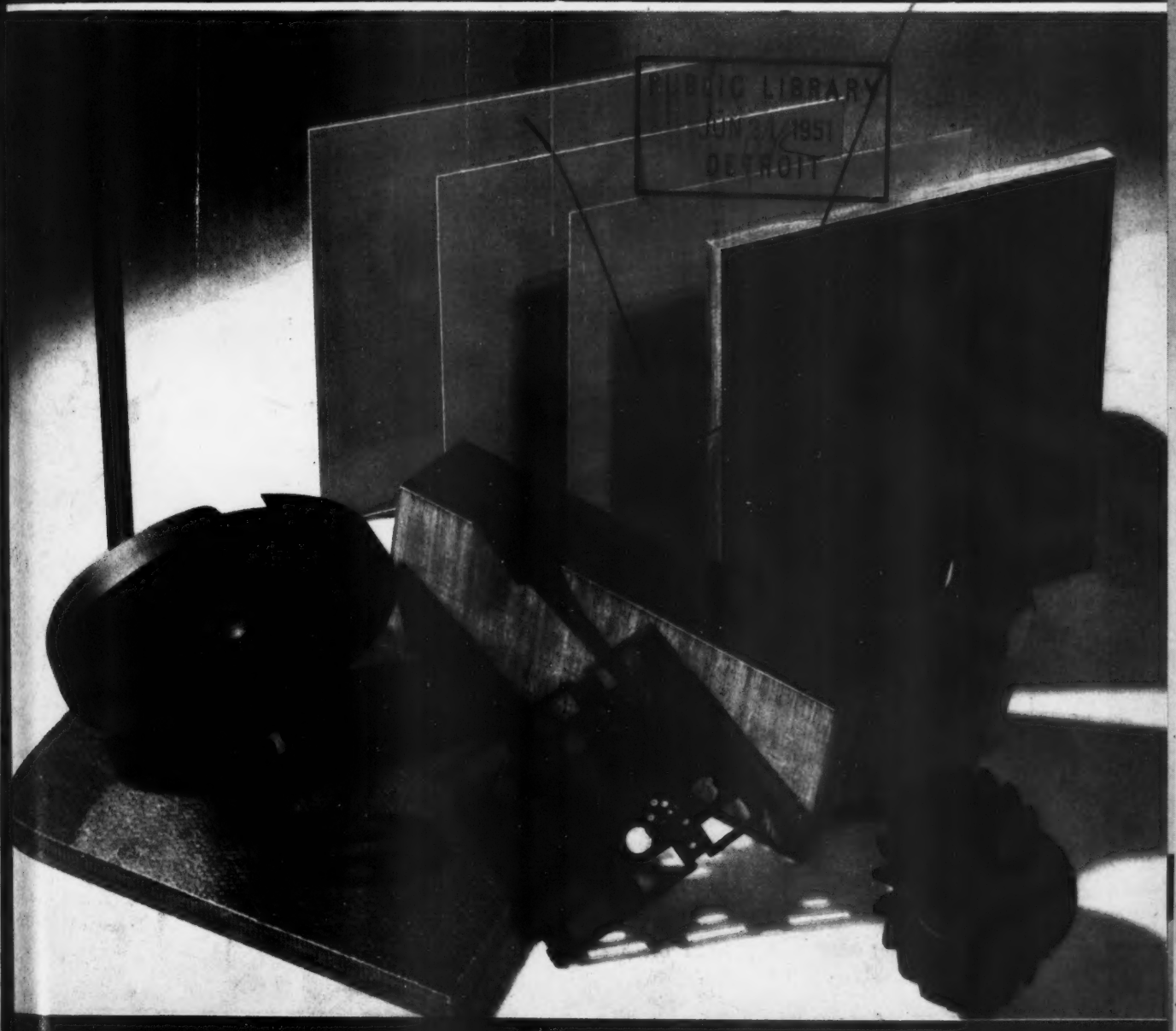

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REGD. TRADE MARKS

Durable, Versatile Materials
for Engineering and Electrical Industries

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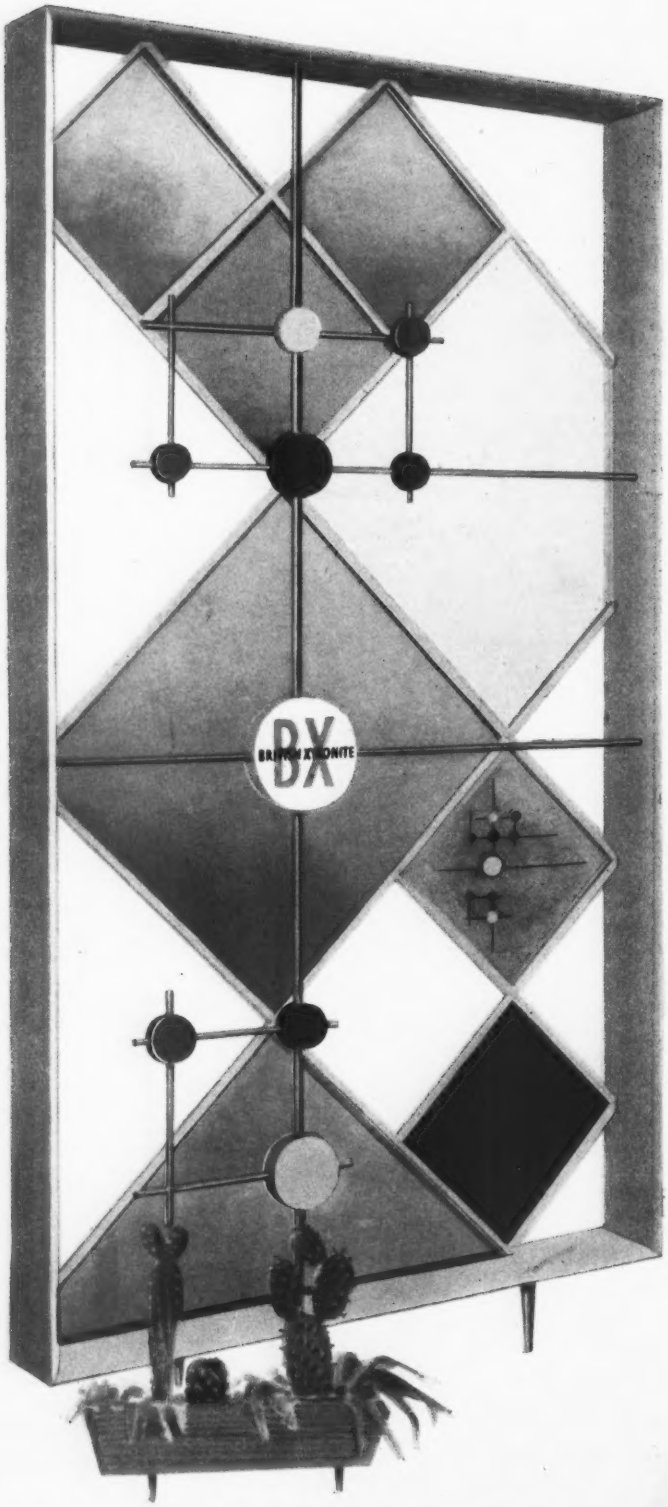

These members of the British Xylonite Group are represented

The BRITISH XYLONITE GROUP

STAND A-11
BRITISH PLASTICS EXHIBITION
OLYMPIA 6th to 16th JUNE

The combined resources of the British Xylonite Group of companies embrace the three main aspects of the plastics industry—the production of raw materials, their industrial applications, the manufacture of finished products serving the needs of the general public.

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HALEX LTD
SCINTILLEX LTD
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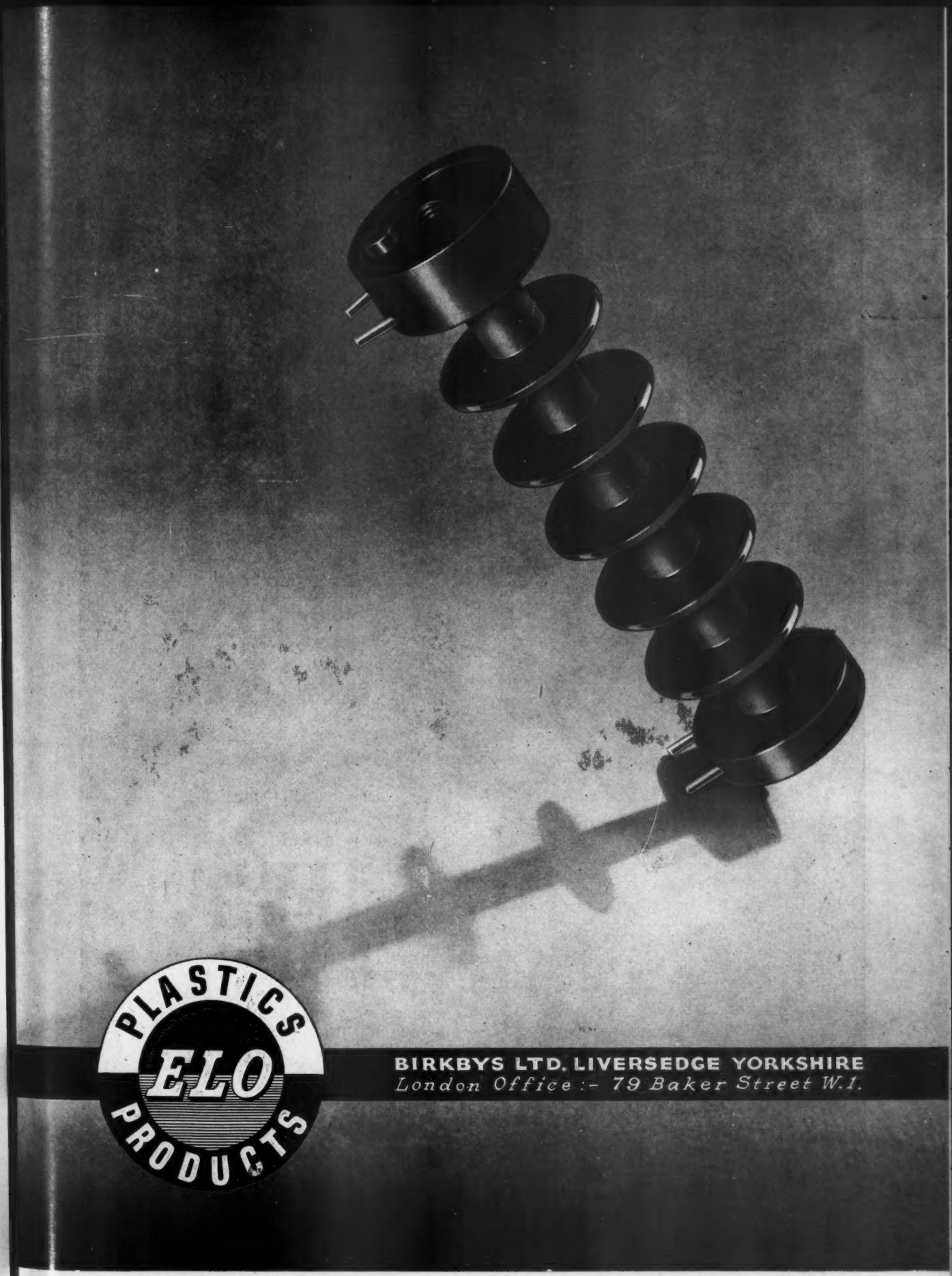
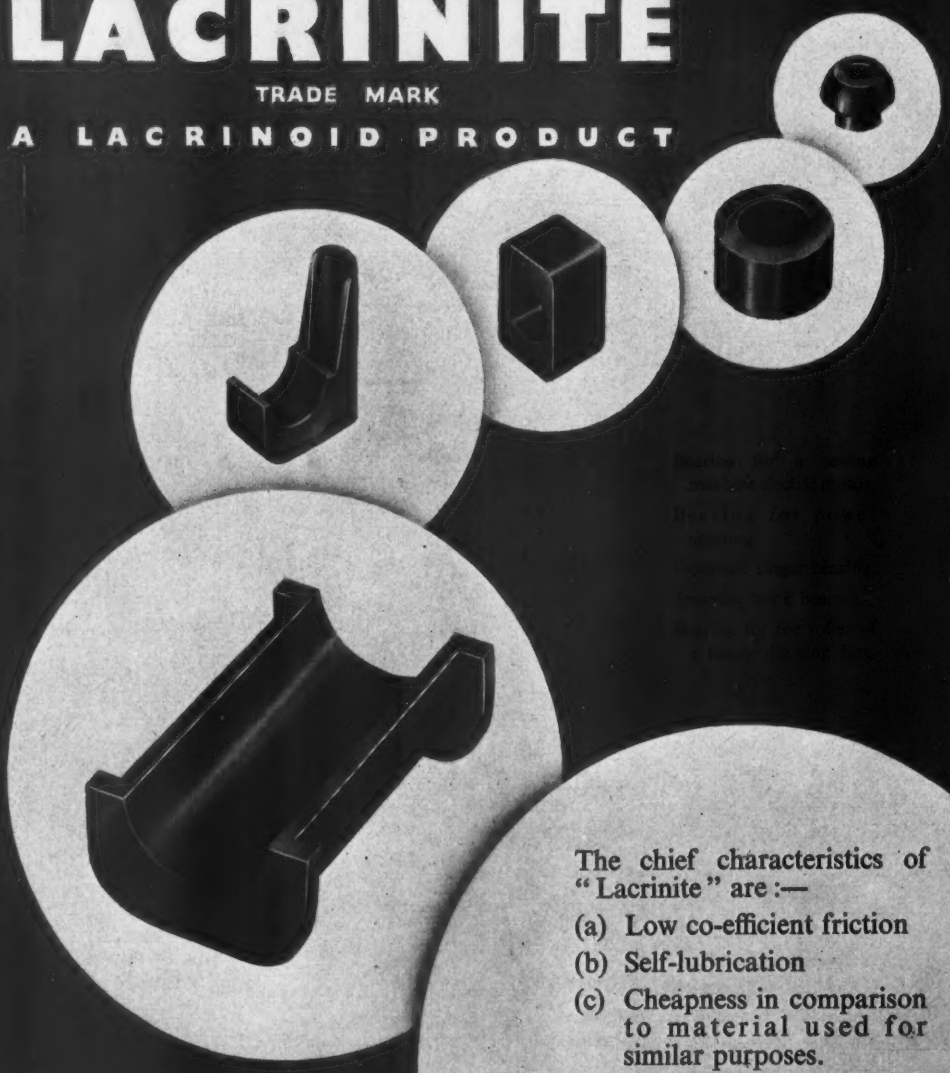


We look forward to seeing you on STAND A 16, BRITISH PLASTICS EXHIBITION, London, JUNE 6—16

A new material
LACRINITE

TRADE MARK

A LACRINOID PRODUCT



The chief characteristics of "Lacrinite" are :—

(a) Low co-efficient friction

(b) Self-lubrication

(c) Cheapness in comparison to material used for similar purposes.

Already, "Lacrinite" is being used extensively as a sealing material in automotive engineering, and will have many industrial applications such as the bearings illustrated, which are now undergoing test runs.

Whatever your requirements in Extruded Plastics we can make them for you—promptly and economically.

From the blue-print stage, from your notes, or even from your verbal description we can supply "just the job."

Why not get into touch with us and investigate the limitless possibilities of Polyvinyl Chloride for your productions?

MELPLAS

Extruded Plastics

Rigid—and Flexible

MELWOOD THERMOPLASTICS LTD.

Willoughby Road, Harpenden, Herts.

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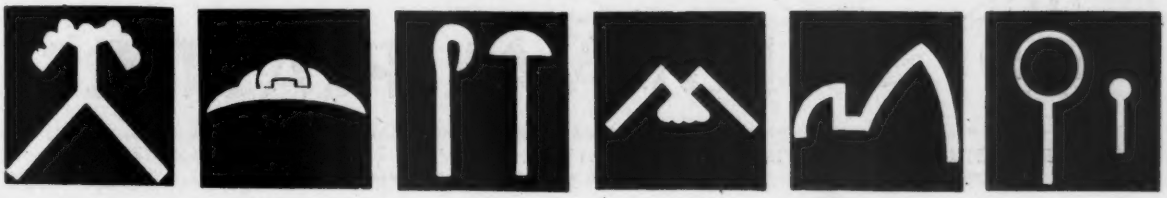

L.26

What could I learn from LORIVAL?

Some people think that plastics don't concern them. But today plastics are a part of everyday life. Your wireless set, your kitchen fittings, your curtains, your tablecloth, your electric light system—they may all owe something to Lorival Plastics. *Behind* the scenes, too, Lorival Plastics are busy, making life run more smoothly for you. Lorival bobbins are used in Lancashire cotton mills. Lorival makes fittings for miners' lamps, aircraft, trains and road transport. Lorival—well, at the British Plastics Exhibition you'll find a large range of interesting engineering and domestic products made by firms who have "left it to Lorival". If you cannot visit Lorival at Olympia, write for leaflet UEL 7.

The answer is at the British Plastics Exhibition at Olympia STAND A14 June 6-16

LORIVAL PLASTICS

UNITED EBONITE & LORIVAL LTD · LITTLE LEVER · NEAR BOLTON · LANCS.

Famous Names

These famous names are but a few of those that EKCO Plastics have the privilege to serve. They know that the Ekco service is geared to handle any moulding problem including industrial design, tool making, complete production — right down to packing the finished product, if desired. Ekco can also supply and assemble pressings, turnings and wiring when necessary — a fine example of a co-ordinated industrial service *under one roof* which is fully backed by facilities for quantity production. If you have a moulding problem why not add your name to the growing list of those who consult EKCO Plastics ?

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STAND No. A20
BRITISH PLASTICS EXHIBITION

EKCO *Plastics for Industry*

Contractors to the Admiralty and Ministry of Supply

E. K. COLE LTD. (PLASTICS DIVISION) SOUTHEND-ON-SEA *Phone: Southend 49491*

Something in common...

'REDUX.' A patented process of bonding metals, metal to wood, metal to rubber and metal to thermo-setting plastics.

'ARALDITE.' A synthetic resin adhesive for metals, porcelain, mica, quartz and other materials. Available in hot and cold-setting forms, this resin is water-resistant and needs only light contact pressure during bonding.

'AEROLITE.' A versatile series of urea-formaldehyde adhesives for gluing wood to wood and to laminated plastics. Suitable for plywood manufacture, veneering and assembly processes with outstanding weathering and ageing characteristics.

'AERODUX.' A cold-setting resorcinol-formaldehyde adhesive for wood, porcelain, rubber, cork, asbestos, thermo-setting plastics and other materials. Withstands boiling water and all common solvents.

'RESOLITE.' Synthetic resin core binders for foundries requiring less heat, and giving better knock-out properties and smoother castings.

The selection can be multiplied, but three interesting little items exemplify the range of purposes for which synthetic resin adhesives are now used.

The new birch-veneered tiles are glued with 'Aerolite' to the old existing floor. The spade handle is glued with 'Aerolite' without screws. The facia panel of decorative wood veneer is 'Redux'-bonded to the original steel pressing. 'Redux,' 'Araldite,' 'Aerodux,' 'Aerolite' . . . throughout industry these resin adhesives are simplifying problems of design and enabling new conceptions to be realised in production.

Aero Research contributions to the study of adhesion include such developments as the peeling test and strip-heating for accelerated glue-line setting. Products like 'Redux,' 'Araldite,' unique in their performance and range of uses, are serving many industries and are waiting to serve others.

Consult our Technical Service Dept. on all bonding problems, and, as a first step, write now for our manual "Adhesives for Industry" and a specimen copy of "Aero Research Technical Notes."

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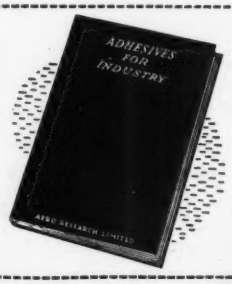

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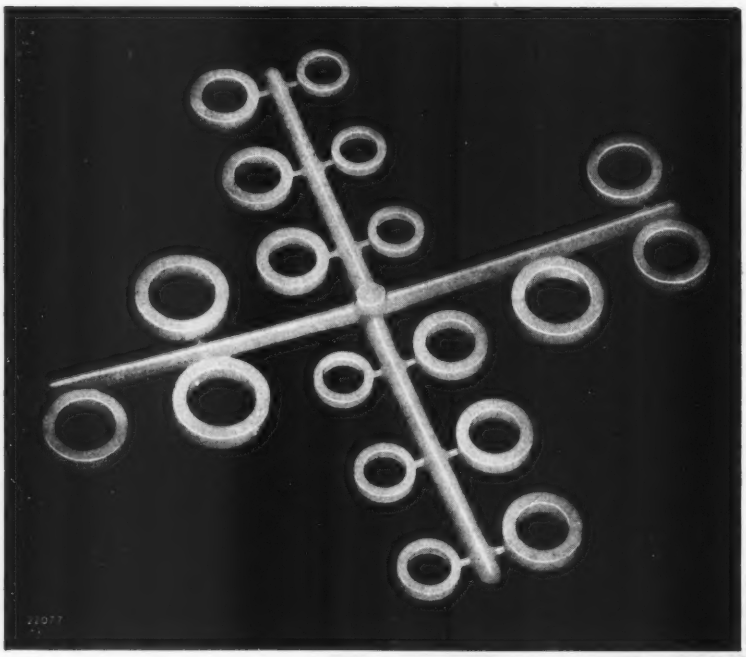
MOULDING NYLON



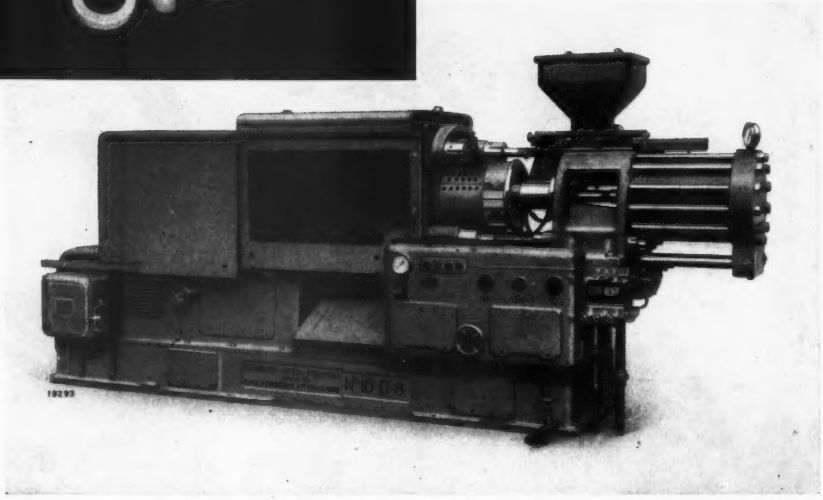
For their "Nyloc" self-locking nuts, Simmonds Aerocessories Limited use nylon inserts, moulded by Plastic Engineers Ltd., Treforest, on a Reed-Prentice 10D-8 Injection Moulding Machine.

Catalogue V.1603 describing and illustrating this machine is available on request.

A special injection unit for moulding nylon can now be supplied for the Edgwick Type "HY" Injection Moulding Machine.

We supply a comprehensive range of machinery and equipment for plastic moulding and pressure die-casting, and specialize in the design of dies and moulds. Our specialists are at your service.

T. H. & J. Daniels Ltd., Stroud, are exhibiting on STAND No. A.24, British Plastics Exhibition, Olympia, June 6th—16th.



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REED-PRENTICE CORPORATION, WORCESTER, MASS., U.S.A.

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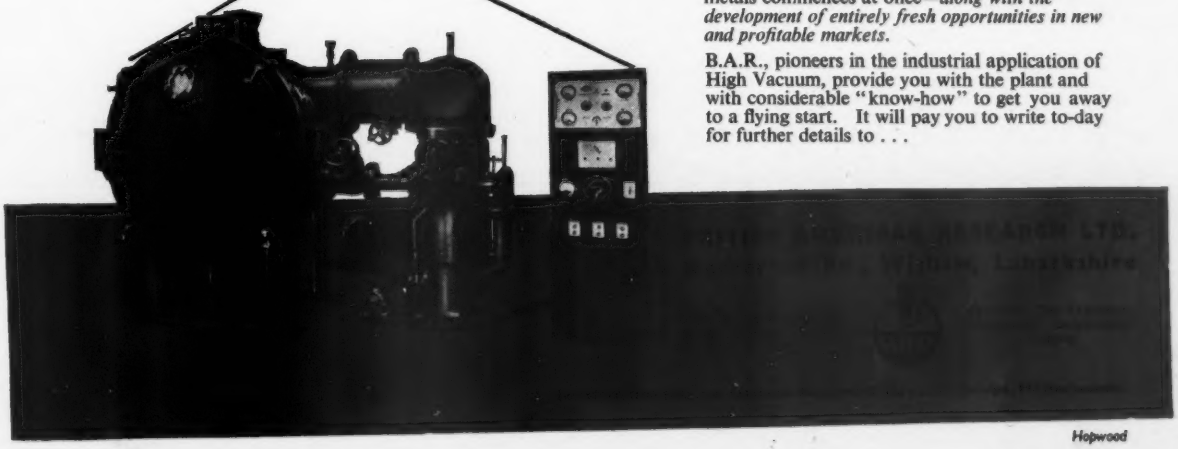
1lb of aluminium can cover 25,000 square feet of surface

A little metal goes a *very* long way with the assistance of B.A.R. Vacuum Coating Equipment.

To put it more vividly, a mere 2 ounces of aluminium would more than cover a tennis court, a 3½-inch cube could coat the near-100,000 square feet of Festival Britain's Dome of Discovery. And such coatings could be effectively stained to represent gold, bronze or other metallic finishes.

The significance to Plastics Manufacturers is that, by using this B.A.R. vacuum process to coat plastic stocks with 0.000003" thin metal layers, conservation of increasingly scarce and expensive metals commences at once—*along with the development of entirely fresh opportunities in new and profitable markets.*

B.A.R., pioneers in the industrial application of High Vacuum, provide you with the plant and with considerable "know-how" to get you away to a flying start. It will pay you to write to-day for further details to . . .



Hopwood

BX thermopl

BX PLASTICS LTD., Higham Station Avenue, London, E.4. *Telephone: Larkswood 4491*

		COMPOSITION
XYLONITE *Regd.*	First made in England in 1877, Xylonite (Celluloid) is the oldest thermoplastic material, yet in many ways still the best for general purposes.	Cellulose nitrate.
BEXOID *Regd.*	Similar in many ways to Xylonite, but is non-inflammable. Its forms include Bexoid Moulding Powder—the standard all-round injection material.	Cellulose Acetate.
LACTOID *Regd.*	*The* material for buttons and dress ornaments because of its delightful colour effects, configurations and brilliant pearl finish.	Rennet casein hardened with formaldehyde.
BX P.V.C.	A material of exceptional strength and scuff resistance which can be produced in varying degrees of flexibility and beautiful fast colours.	Polyvinyl Chloride plasticised.
BX COPOLYMER	A new dimensionally stable and non-inflammable material.	Vinyl chloride copolymers.
BX LAYFLAT TUBE	A thin-walled tubing specially made for packaging. Saves packaging time, affords complete protection. Ideal for frozen foods.	Polythene.
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BX ETHYL CELLULOSE	A tough thermoplastic similar in many ways to Bexoid.	Ethyl cellulose, plasticised.
BEXOL SOLUTIONS	Over three hundred solutions with thousands of industrial applications.	Solutions of plastics in organic solvents.

plastic materials

ITION	HOW SUPPLIED	PROPERTIES	MANIPULATION	TYPICAL USES
nitrate.	heets; Rods and Tubes; Film; olutions.	Great toughness and rigidity. High transparency. Low water absorption. Dimensional stability. Colour range unlimited.	All processes except injection moulding; thin sheet may be easily blow moulded with steam.	Knife handles, fountain pens, cycle pumps and mudguards, drawing instruments, shoe heel covering, piano keys and toothbrush handles, cutting plates and bars.
Acetate.	heets; Rods and Tubes; Extruded ections; Film; Solutions; Moulding Powder: Also "Armourbex" wire reinforced) and "Cinabex" special safety material for lighting chemes).	Tough and non-inflammable. High Transparency. Unlimited range of opaque, translucent or transparent colours.	Moulding, blowing or compression from sheet. In the form of moulding powder can be used on all types of injection machines.	Lampshades, optical frames, toys, packaging. Injection mouldings for aircraft and car accessories, dress ornaments, combs, instrument panels, toothbrush handles.
ein hard- Formalde-	heets, Round and shaped Rods; ubes; Discs.	Tough and non-inflammable. Wide colour range. Takes a brilliant polish.	Sheet moulding, bending, blanking and punching; drilling, sawing, turning, gluing and polishing.	Buttons, buckles, electrical plugs and switches, furniture handles, knitting pins, fountain pens and pencils.
Chloride	heet, Extruded rod, tube and ctions, Compound for extrusion r injection moulding.	Tough and flexible. Phenomenally hard wearing. Will not rot or perish. Acid and chemical resistant. Waterproof. Good electrical properties. Unlimited colour range.	Sewing, high frequency welding, injection moulding, extrusion.	Handbags and travelling bags, rainproofs, fancy belts, upholstery, shoe soling, medical and technical tubing, cable covering, industrial aprons and gloves.
de copol	Sheet.	Exceptional dimensional stability. Good chemical resistance. Good mechanical and electrical properties. Non-inflammable.	Machining by most standard woodworking processes. Draw-moulding, Printing, Embossing.	Slide rules, Scales, Dials, Lighting fixtures.
hene.	continuous lengths of tube in widths 2" 20" and wall thickness 1¼ to 5/1000" or into sheets up to 24" wide.	The lightest of all plastic materials. Remains flexible in extreme cold. Water and vapour proof. Tasteless, odourless, non-toxic. Resistant to most acids and greases. Transparent.	After cutting to length required, heat seal one end, insert product, heat seal other end.	For protective packing of foodstuffs, engineering and electrical parts, chemicals, tobacco and all general packaging purposes including container linings.
tyrene.	Rigid sheet, Rod, Tube and Foil.	Low power factor. High volume resistivity.	Easily sawn, turned, drilled, milled, threaded and tapped.	Electrical equipment.
corruga etate film.	Standard pads 24" x 24". Flexible pads 23" x 20".	Low Thermal conductivity. Extreme lightness. Non-inflammable. Non-porous and non-absorbent.	Can be cut to shape with an ordinary knife. Very easy to assemble.	Air conditioning and refrigeration insulation of all kinds; ships, rail and road transport vehicles, caravans.
methacryl	Rod.	High transparency. Very low burning rate.	Sawing, Turning, Drilling, Milling, Cementing.	Umbrella handles, Display-fittings.
ulose, pla	id Sheet, Rod and Tube. Profile tions.	Very tough and stable over wide temperature range. Slow burning. Wide colour range.	Moulding by all processes. Machining. Cementing. Printing.	Lampshades, Refrigerator fittings, Radio dials.
of plastics vents.	In liquid form.	Various, according to purpose. Details on request.	Brushing, spraying or dipping.	Sticking, staining, sealing, softening, labelling, laminating, dip-coating.

PAPERS FOR PLASTICS

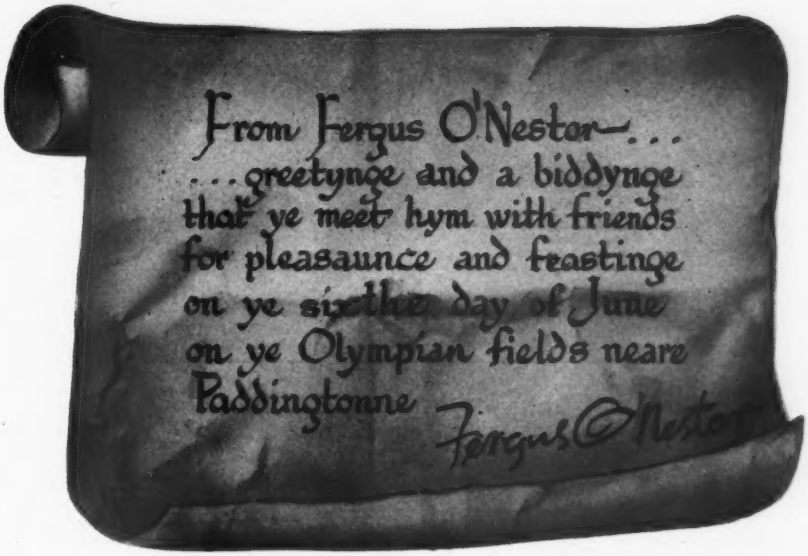
STAND G6

first floor **BRITISH PLASTICS EXHIBITION**
OLYMPIA
JUNE 6th — 16th, 1951

THE WIGGINS TEAPE GROUP
ALDGATE HOUSE, MANSELL STREET, LONDON, E1

The Ferguson Tradition

Invitation
A.D. 1251



Invitation
A.D. 1951

BRITISH PLASTICS EXHIBITION

Olympia—June 6-16

where the firm of FERGUSON'S will be

"AT HOME"

AT STAND A.21

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EINAR HOLMARK 19, G1. Kongeyej, Copenhagen V, Denmark.

C

This is the Lustrex building in the new Monsanto works at Newport, Mon. It is a special purpose plant based on Monsanto's long experience as producers of polystyrene and designed for bulk production of this important material.

The plant came into operation, as scheduled, in September, 1950. Thus, for the first time British-made polystyrene was available in bulk in a wide range of colours.

Lustrex maintains the high quality associated with all Monsanto products and availability will improve when raw material resources are developed, but this must needs take time. This will enable British designers to further their ideas in exploiting this versatile plastic.

Lustrex will be displayed on the Monsanto Stand at the British Plastics Exhibition STAND No. A3

Lustrex *the registered trade name for Monsanto's*

POLYSTYRENE MOULDING CRYSTALS

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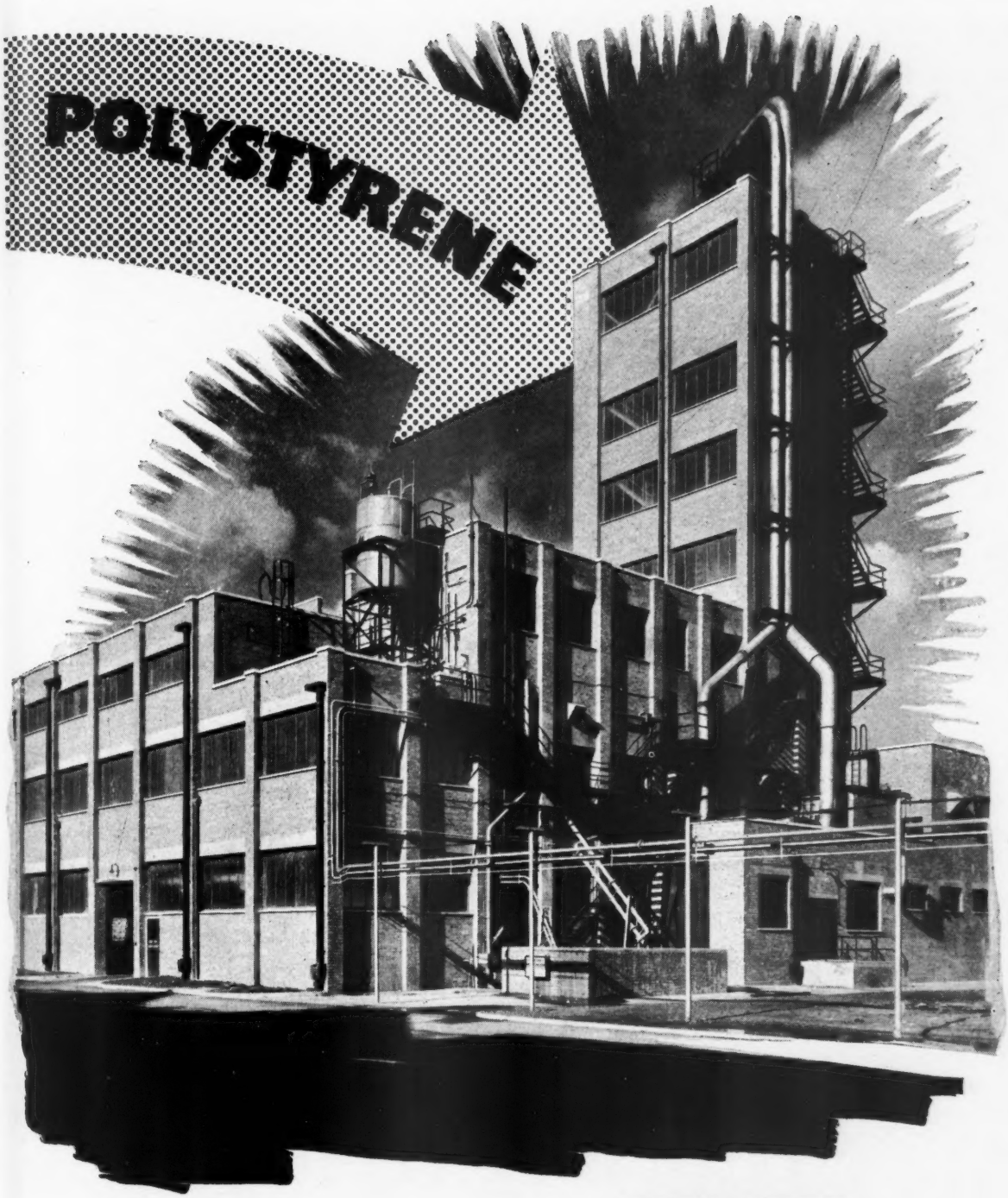

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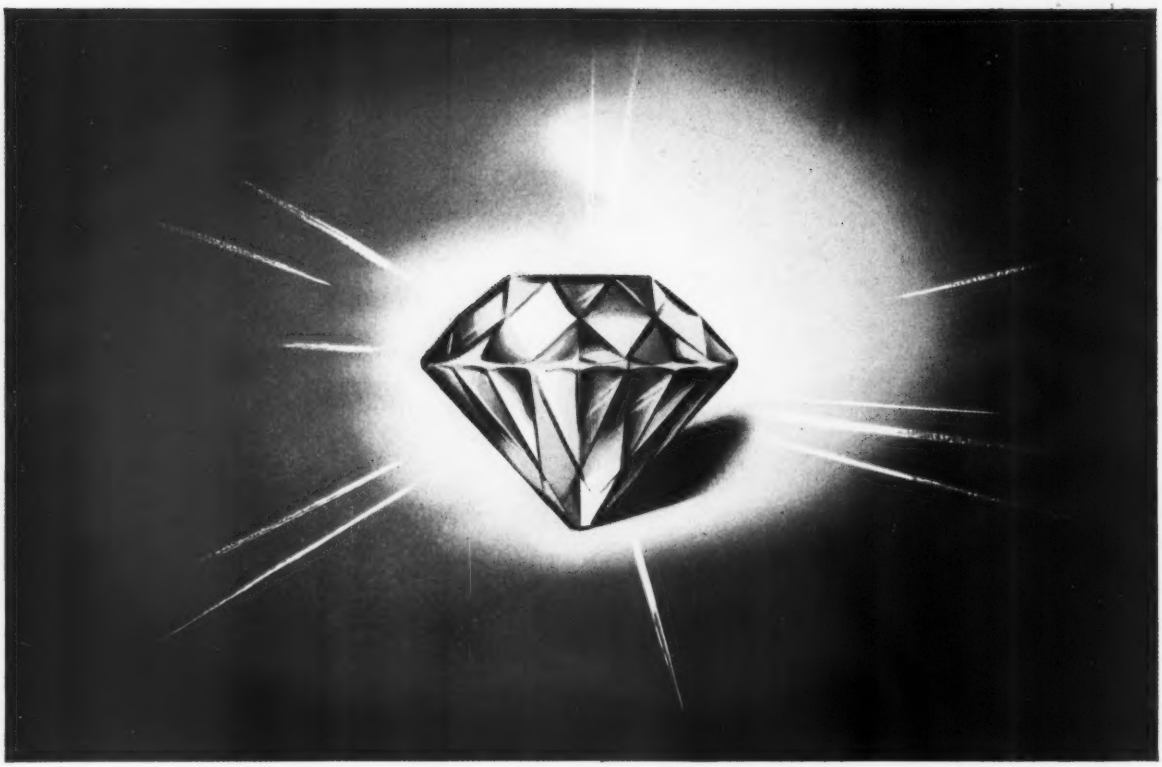

Colours that SELL

There is a correct selling colour for every manufactured article. Sometimes colour selection is fairly simple; but sometimes subtle hues and intricate tones are required, and the search for a shade that is 'just right' is far from easy.

That is why we recommend to you "WELLITE" CELLULOSE ACETATE MOULDING COMPOUND. It is produced in uniform, dust-free, cubical pellets under controlled conditions to ensure uniformity and in a standard range of well over 100 colours. Moreover, we guarantee to match exactly *any* particular shade you want.

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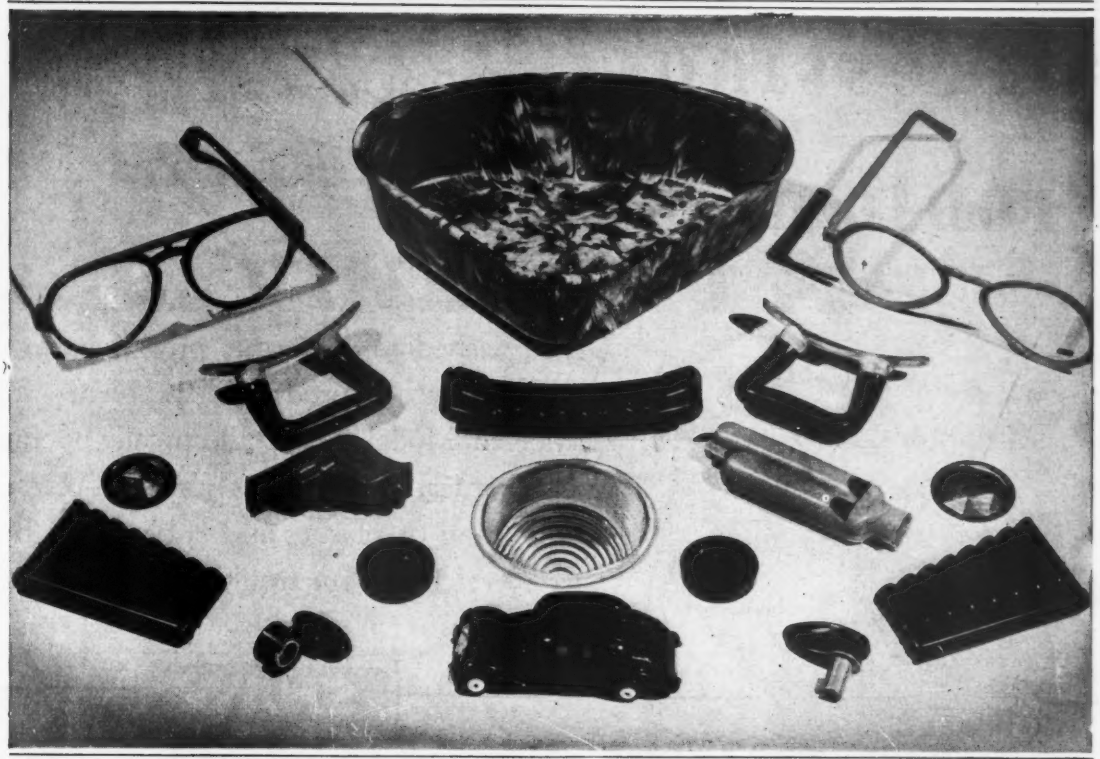
MOULDS



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There must have been occasions when you wished to vary your press loading to suit a particular production problem. The McNeil Model 800-32 Electrically-operated Mechanical Goods Press for high-pressure moulding of plastics and rubber will help you overcome your troubles.

SHAW

- Motor operated—no hydraulic.
- 800,000 pounds total pressure.
- 32″ × 32″ drilled steam platens.
- 780 pounds per square inch platen pressure.
- Simple speedy adjustment of lower platen.
- Adjustments for mould loadings zero to 400 tons.
- Range of mould thicknesses 1″ minimum to 5″ maximum or 2″ minimum to 6″ maximum.

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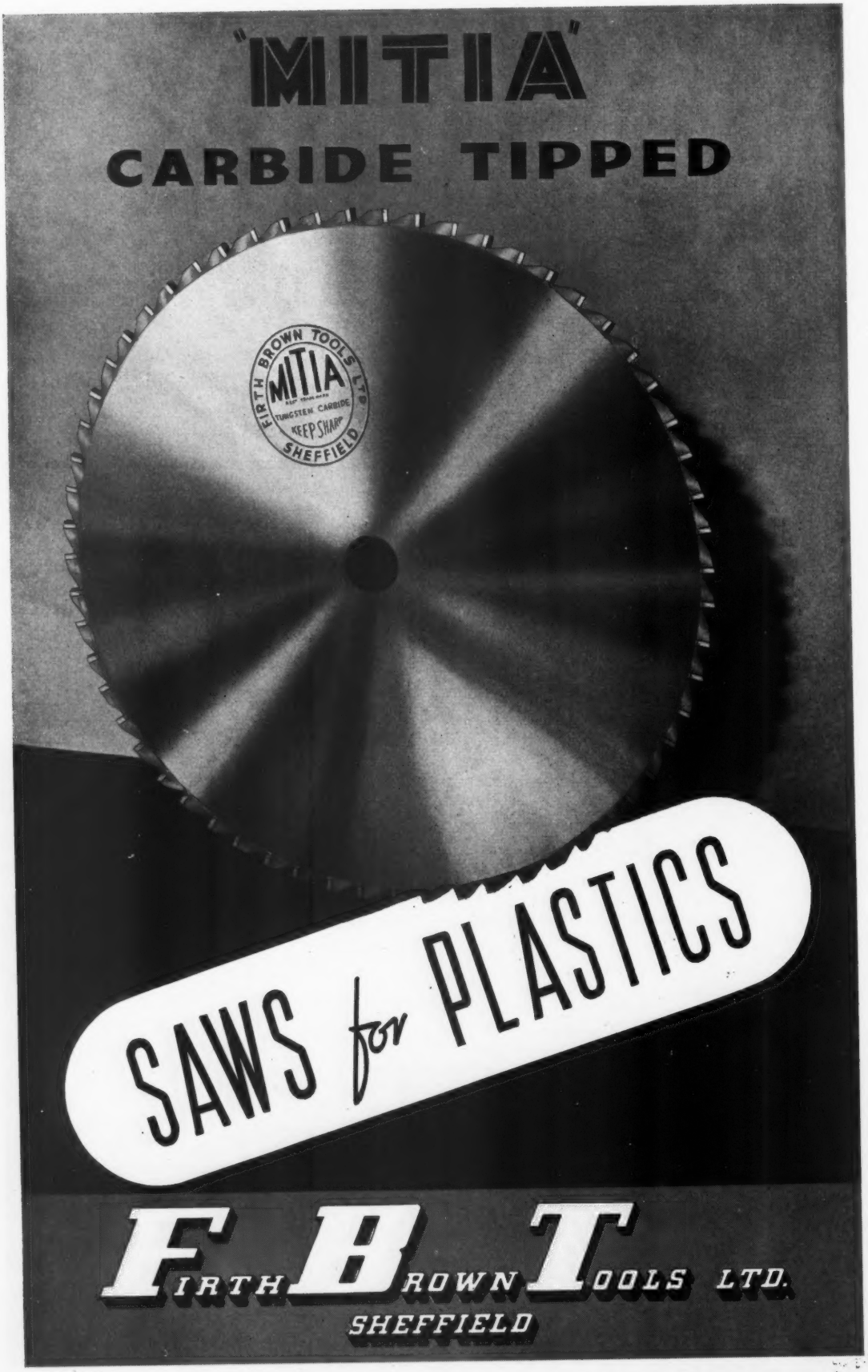
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The DUMBRILL "MODEL A" MIXER

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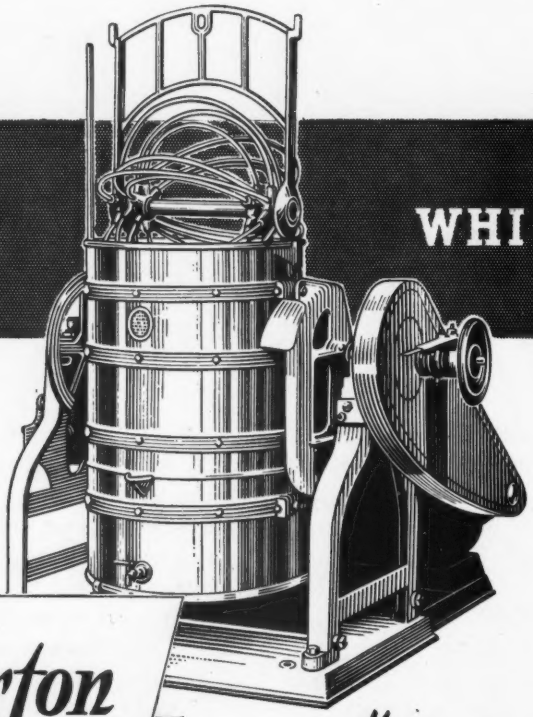
the mixer with a mission

. . . and the mission is — to ensure successful mixing at the most economical cost. Morton Power Whisks are particularly suitable for heavy duty work and are already in use in a wide variety of industries. Three models are available; the Standard Tilting Type, the Rigid Type and the special model which combines the principal features of the Standard Tilting and Rigid models.

Ask for full details, or our area representative to call — he will be glad to discuss your mixing problems.

POWER WHISK



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Have you checked the possibilities of

I.C.I. NYLON?

WE PRODUCED THE FIRST INJECTION MOULDING IN NYLON IN THIS COUNTRY IN 1940

Take advantage of our experience in this field; remember — the more difficult it is, the more we like it.

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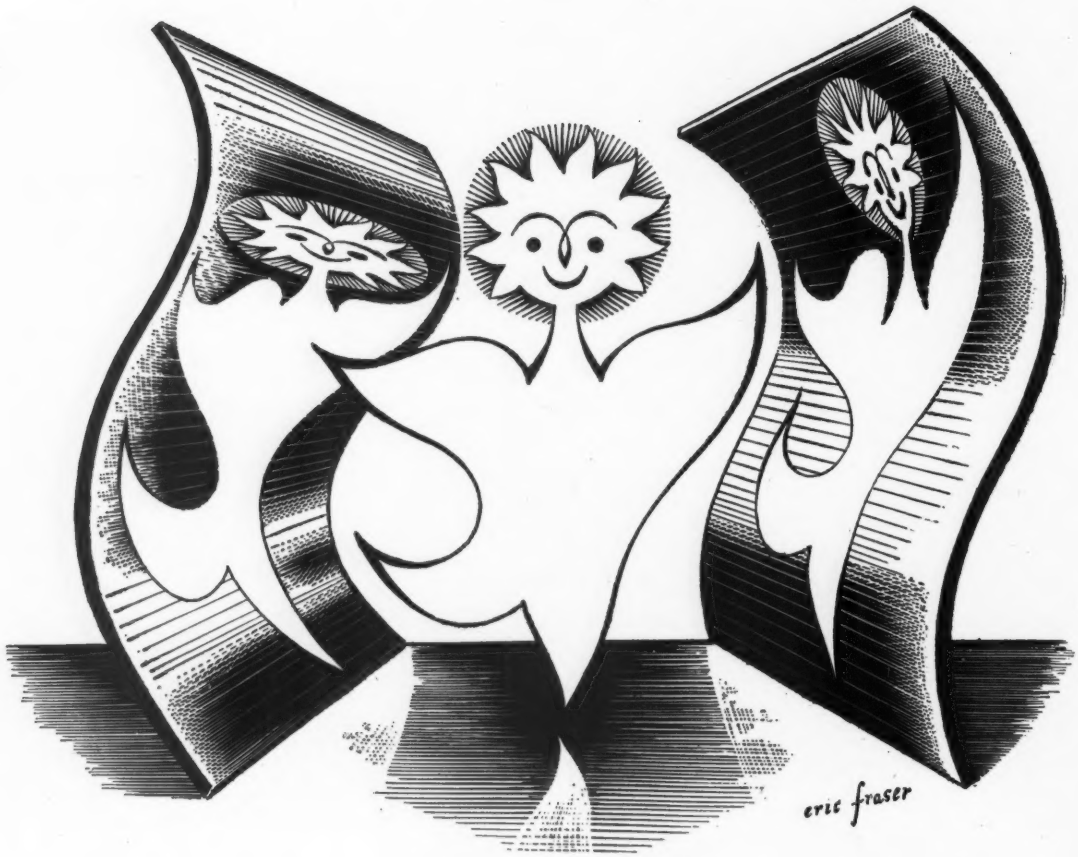
Telephone: COLINDALE 7163 & 7956
Telegrams: PUNFIBARS, HYDE, LONDON

We are exhibiting at the BRITISH PLASTICS EXHIBITION 6th—16th June, STAND No. B.8

We regret that we cannot show all of the lines, due to official secrecy and customers' requests.



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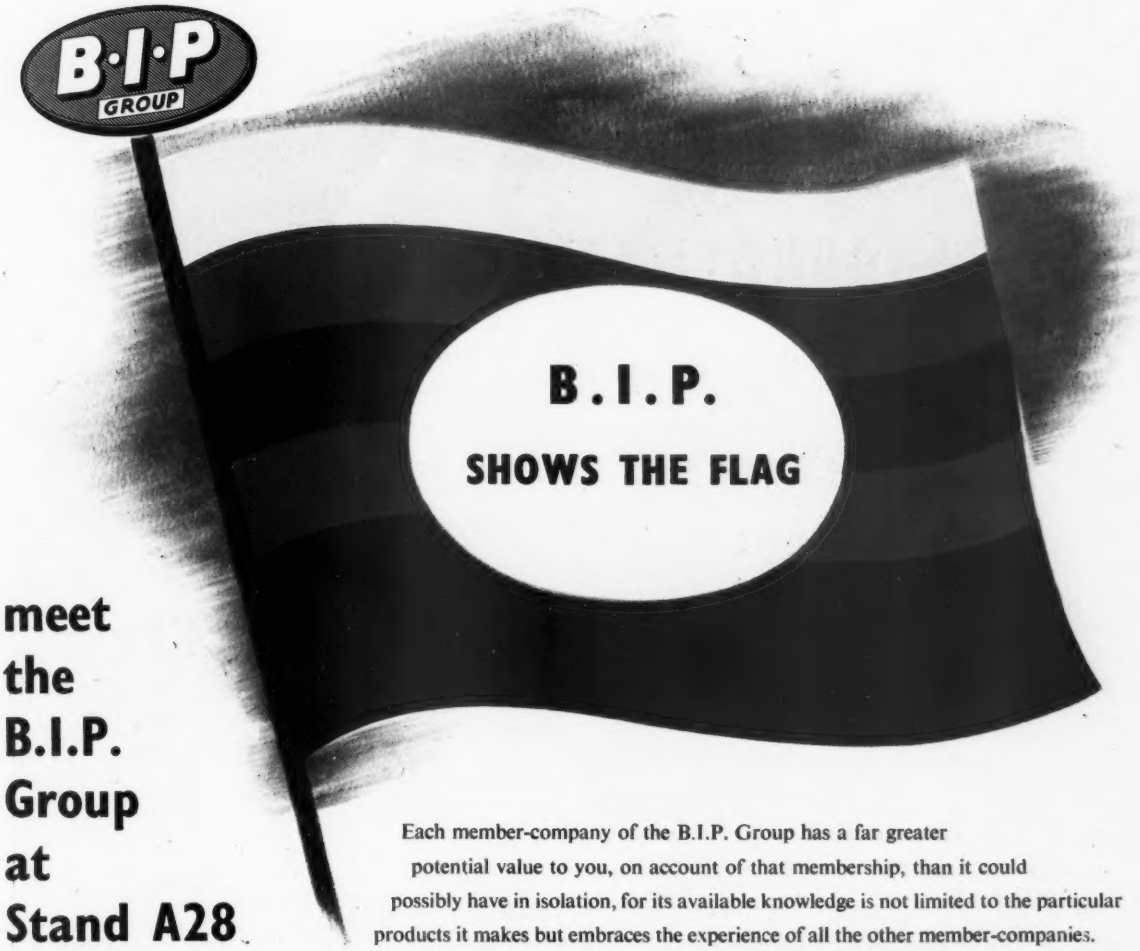

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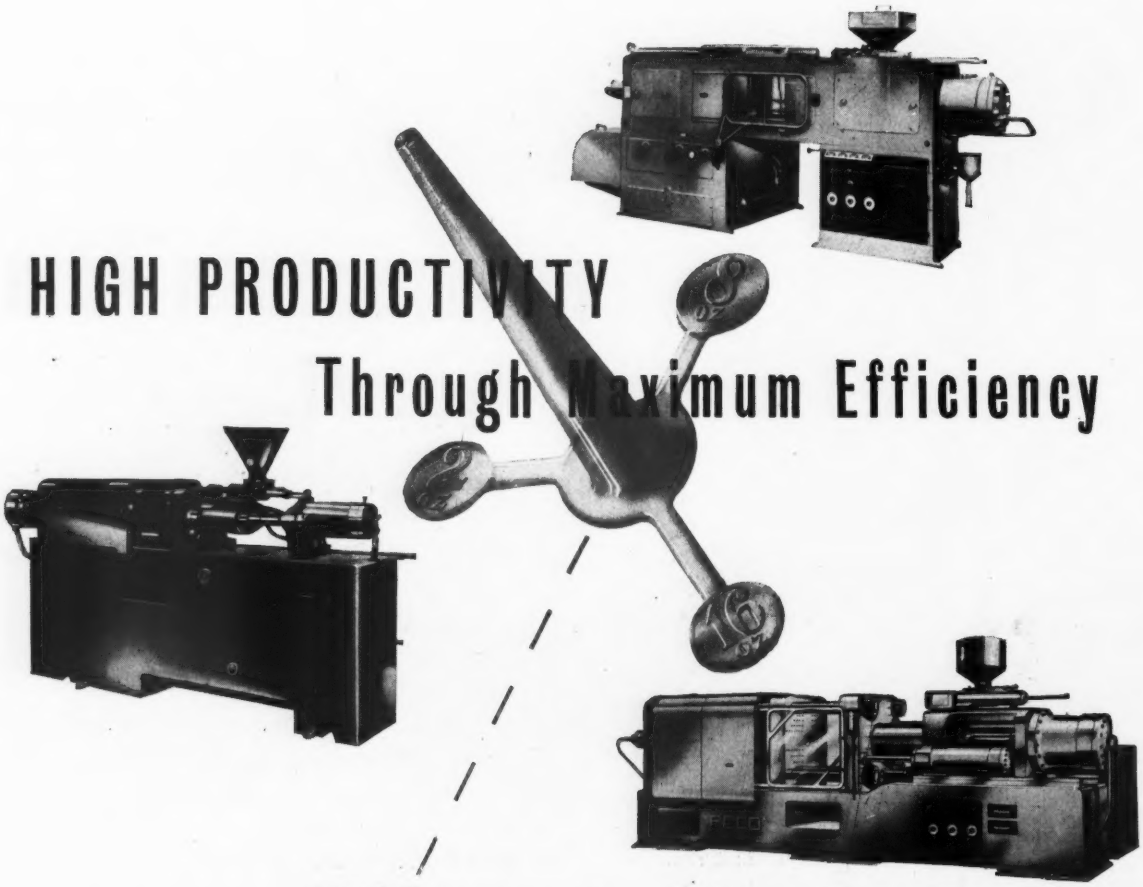

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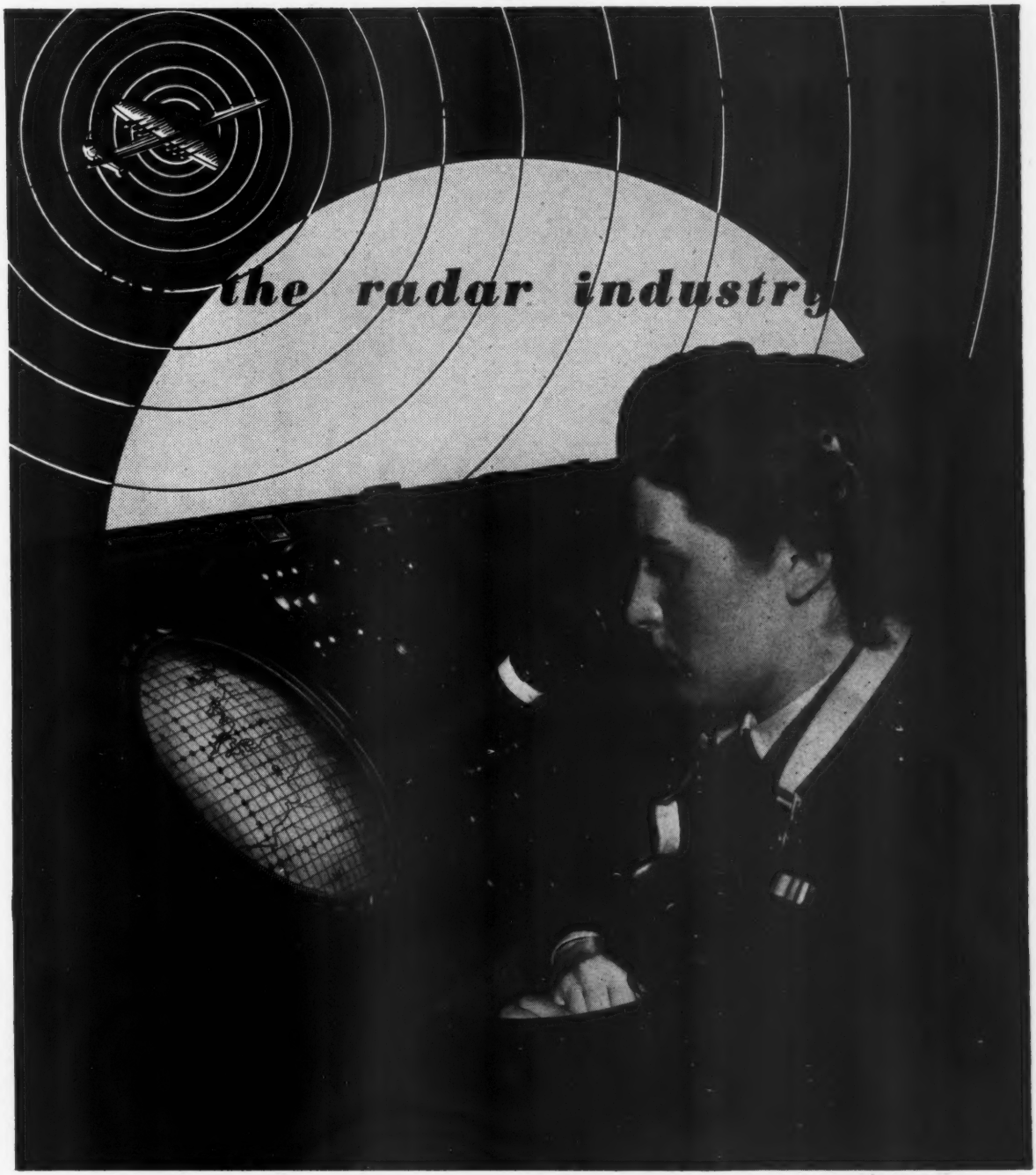

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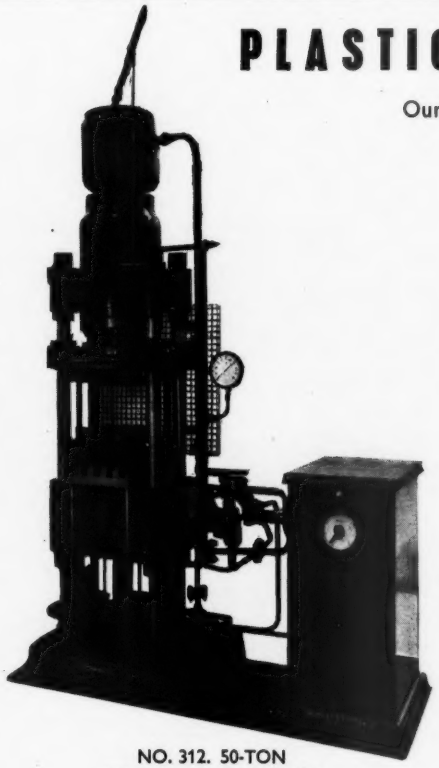

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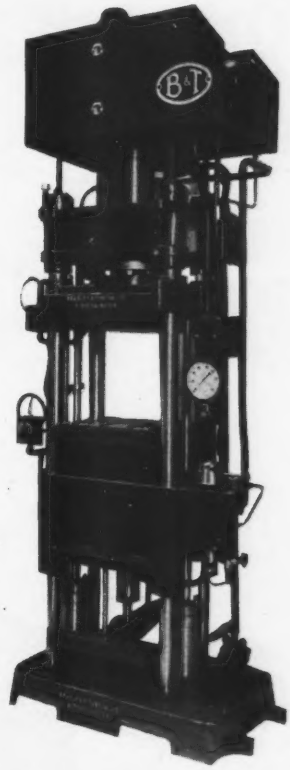

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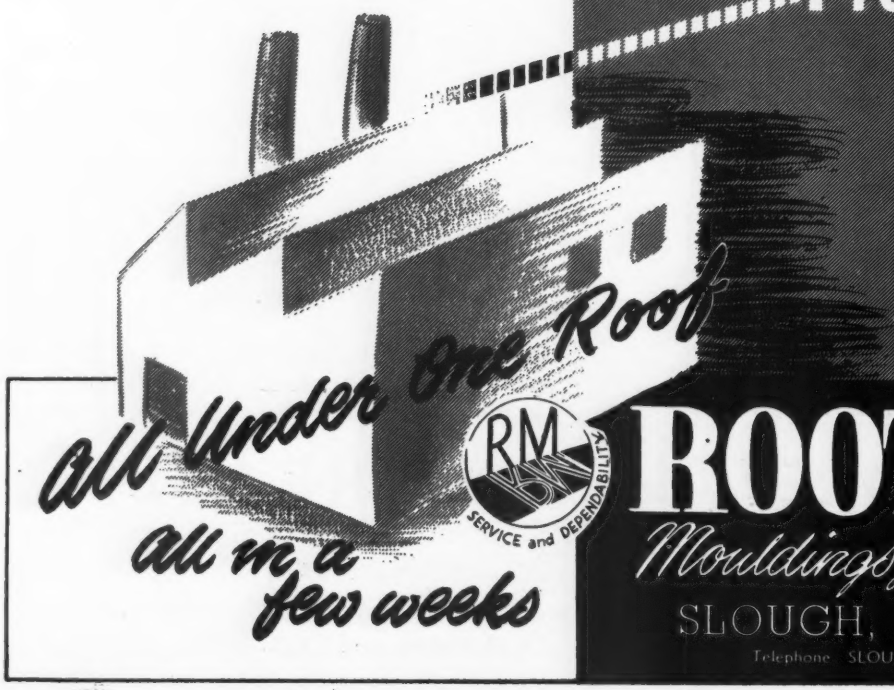

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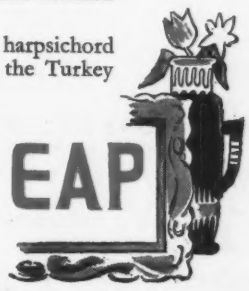
"In our next advertisement," said the Managing Director, "Take the mike out of my office and ask the chaps in the Trade to drop in." In our Philistine sort of way that is just what we've done. Come on then, Chaps, rally round.



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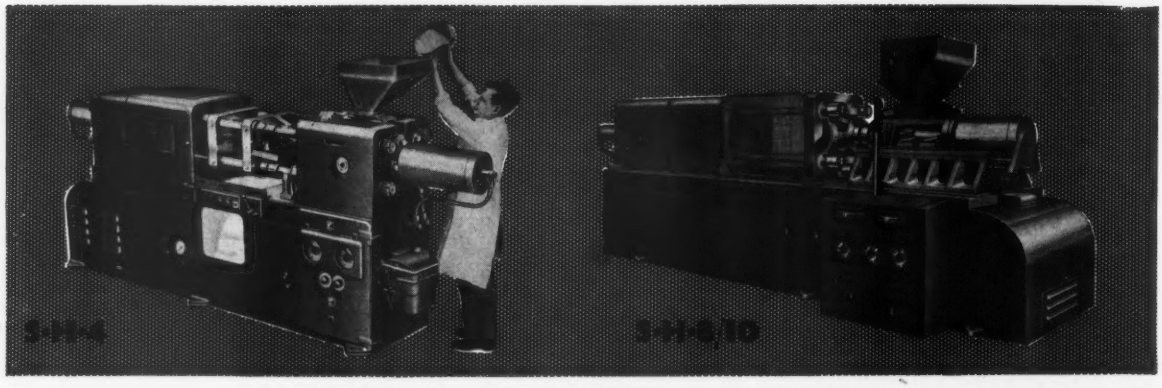
see Windsor's exhibits



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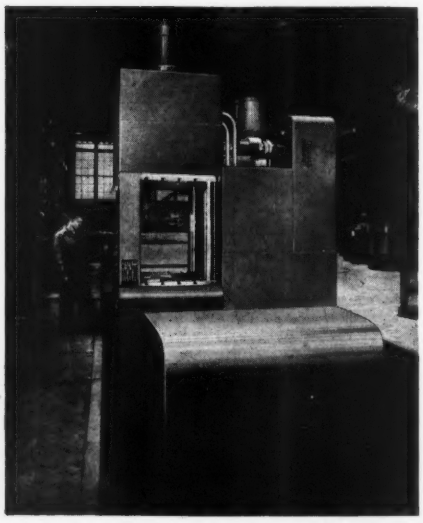

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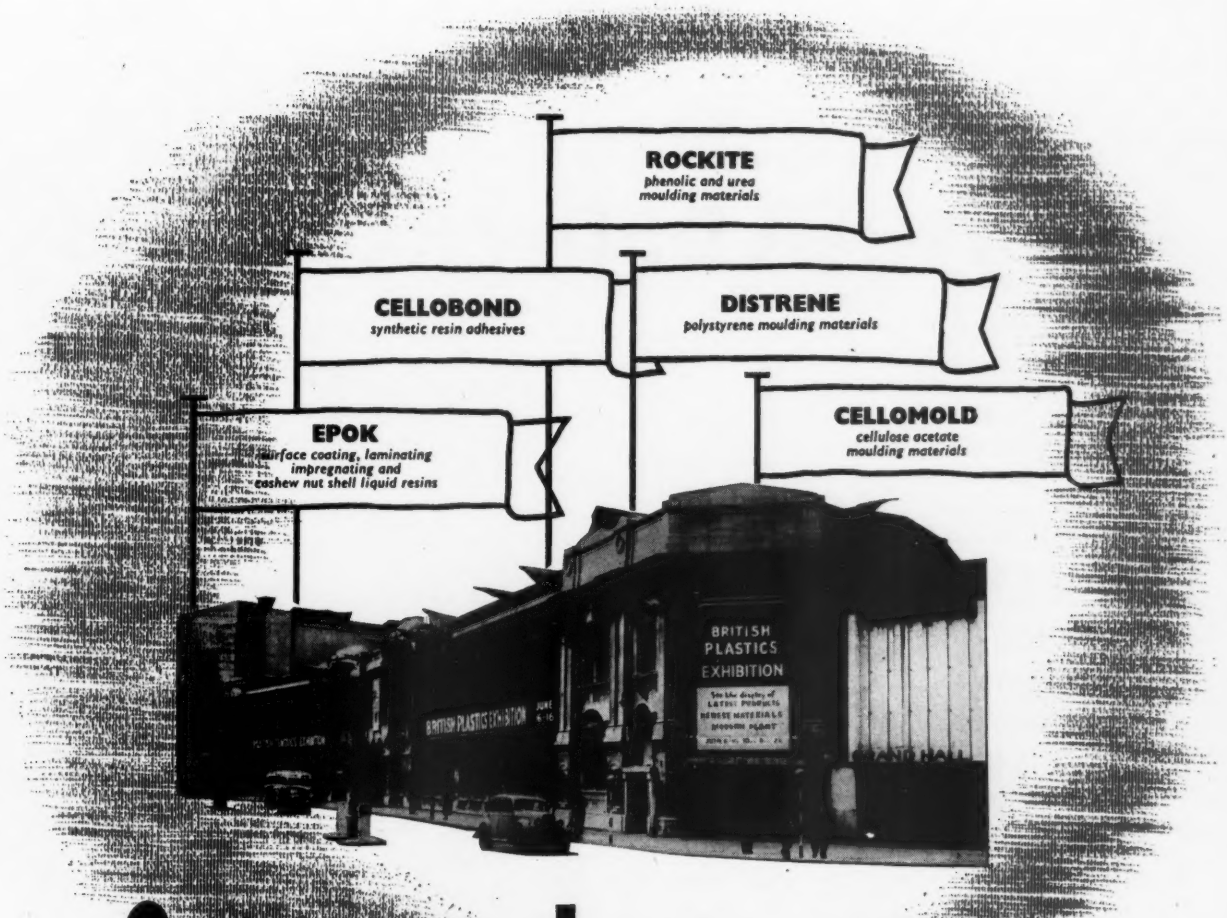

Our own show ...

does not, of course, occupy the whole of Olympia, but it does merit quite a bit of flagwaving. At our stand, Number A22, you will not only be able to investigate fully the properties and uses of our entire range of products, but also to discuss their further potentialities. If you are concerned with phenolic, urea, polystyrene or cellulose acetate moulding materials; with resins for lamination, impregnation or surface coating manufacture; or with synthetic resin adhesives—you need go no further than the B.R.P. stand. If you are unable to visit the show, why not discuss your problems with our Sales and Technical Service at 21 St. James's Square, London, S.W.1? (Telephone: Whitehall 8021 (7 lines)).

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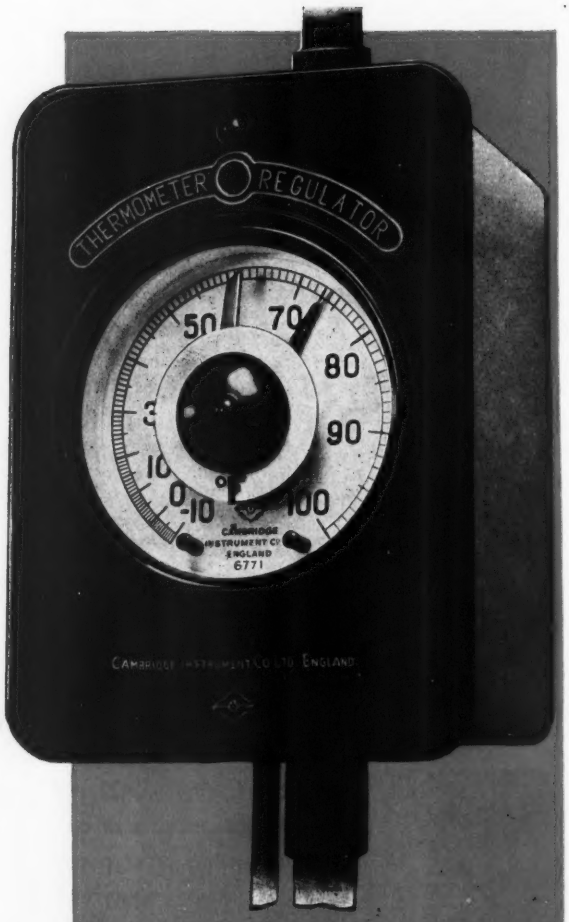

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Plastics

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PROPRIETORS: TEMPLE PRESS LIMITED

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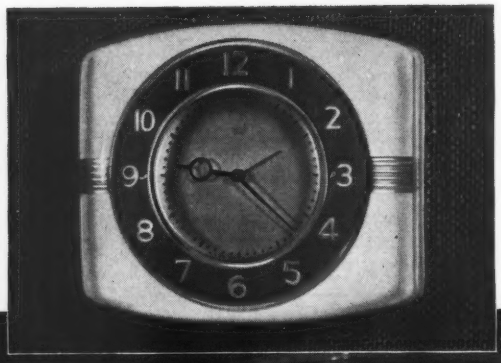
EDITOR: M. D. CURWEN, B.Sc., A.R.I.C.

Published monthly in London, England.
Annual subscription rate 34/-. Shorter periods pro rata.

Moulding shop of Ranton and Co., Ltd., Brentford, Middx, showing some of the 60 presses by John Shaw and Sons (Salford), Ltd., and T. H. and J. Daniels, Ltd., ranging from 70 to 200 tons.



Large illustration shows the clear, thermoplastic mouldings before spraying. Smaller illustrations show the finished "New Era" Alarm and the "New Style" Sectric clocks as marketed by Smiths English Clocks Ltd., through whose courtesy these photographs are shown.

OLYMPIA JUNE 6-16
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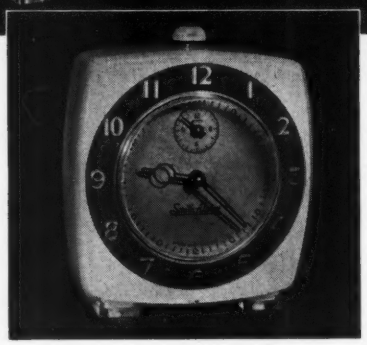
SEE OUR EXHIBIT
STAND A15



clear thermoplastics for the new Smith clocks

In this interesting development a clear, thermoplastic moulding, made by British Moulded Plastics Ltd., carries all detail on its inside surface, leaving the exterior quite plain. The dial face is left clear, but the figures with their background and the surrounding case are spray-painted from the inside, giving a very attractive contrasting colour effect.

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Plastics

VOL. XVI. No. 167 JUNE, 1951

" When (cattle) horns separated from the sloughs have lain months one, two or three, they are cut into fit lengths, and held with pincers over a little wood fire, which makes them plyable; then they are cut lengthways with a short spud knife, and with a pair of pincers in each hand, with broad and long knippers they are opened and made to lie almost flat, and then put between two hot iron plates first rub'd with grease, and then prest several of them together in a hole in the ground, where at the end there is another hole to put in a wooden wedge, which is knockt in with a great wooden beetle, 'till the irons are prest so close as to make the horns quite flat and smooth . . . There are about twenty horners, that one with another may make about fifty thousand plates each a year, and about three score thousand lanthorn-leaves."

John Houghton, F.R.S., " Improvement of Husbandry and Trade," No. 105. London, 1694.

EDITORIALS

Fairs, Festivals and Exhibitions

THE year 1951 will be considered a strange year in British industrial history. To the ordinary being, although not to the diplomatist, it has been a year of war in at least two portions of the globe and, in consequence, a year of exceptional shortage in new materials and very high prices for them. Yet we can, apparently without too much misgiving, show our industrial medals on a scale greater than ever we have done before. The British Industries Fair has blazed (with somewhat less than normal heat from the plastics angle) and is now past; the Festival of Britain is in full blast and the public is seeing, and will be allowed to see until October, something of our products; a second Trade Fair, the British Plastics Exhibition, with a Convention, begins on June 6.

Judged by the rather necessary standard that trade fairs should reflect the products of our industry and give the public an idea of our aims, the B.I.F. was a success, even in its curtailed and condensed form. Judged by the also necessary standard that the individual members should make money out of trade fairs, results are far too early to assess. In the past few years the trade and industrial moulders have not considered the Fair to be profitable from this point of view, a view based on practical experience, that is, on the opinion that new customers are rare, that when they do appear business is not done on exhibition stands but as a result of technical discussions at the works, and that existing customers and friends need no fair-stand to attract them.

On the other hand, it seems difficult to correlate this expression of ideas with the fact that, because of shortage of almost all traditional raw materials, so many manufacturers are turning to plastics for solutions to their problems. It appeared to be an opportunity for a bigger effort to teach such manufacturers something of the properties and potentialities of our materials, and to impress them with what has already been done. It is a pity not to do so wholeheartedly and vigorously, even during an equal period of shortage in plastics—a shortage which, perhaps with the exception of " phenolics," is slightly less severe than it was a few months ago.

Certain sections of the industry always do well at the Fair, both at home and in the export trade, in spite of continual shortage. These appear to be more common in the lighter side, in fancy goods and toy trades. Trade with the U.S.A. and Canada, for example, has been reported as very good mainly, perhaps, because of the rate of exchange. It has always puzzled us why technical units should not also be exported because of this advantage, but perhaps the liaisons are not in existence. Trade fairs exist to promote them.

There is one branch of the plastics industry that really flourishes despite the " shortage " scare, and has done exceedingly well at all fairs during the past two or three years. The plastics machinery industry has grown enormously in capacity, in quality and in design. Business has been excellent, and the whole world is buying from British makers. There has been a very encouraging and courageous tendency for manufacturers to travel to the four corners of the earth to get this business.

Taken by and large, the plastics industry has done very well during the past year—exceptionally so under the conditions. But the raw material producers " have nothing to sell "—a statement which means that new and expanding business is almost impossible; obviously, nor can moulders and fabricators take on new business at the moment. This may, in consequence, seem a strange time, especially so soon after the B.I.F., to hold a second trade fair, the British Plastics Exhibition. We should have preferred a hiatus of some six months between the two, but if the trading results appear, there will be no doubt that an exhibition exclusive to plastics is what our industry needs. From one point of view, we regret that at this stage of the plastics industry's life so much stress must be laid on actual concrete results. We are still in the phase of having to teach the world about the most remarkable industry that has so far appeared; this teaching is a costly business, but we wish more far-sightedness were employed. On the other hand, as somebody has already remarked, business is business. Perhaps the British Plastics Exhibition will accomplish both, an event which may lead eventually to what we consider an even more useful adjunct to the industry, the permanent " Plastics Centre," similar to the " Building Centre " that has flourished to the profit of the building industry these many years.

The Future of Nylon

WHILE the moulding of nylon is comparatively rare in this country and, indeed, far from common, yet in the land of its birth—the U.S.A.—a number of moulders have been actively engaged in producing important nylon components for some years. One, as our story on page 155 tells, made his first experiments in 1940, when the first samples were made available. As we explain, the reasons for this rarity have undoubtedly been due to the difficulties of moulding inherent in the properties of nylon, chief among them being the very

fluid conditions existing at the high moulding temperatures. From the lessons learnt, moulders have made adaptations to their normal machines. On the other hand, plant makers have also studied the problems, and to-day machines are available to deal with all types of thermoplastics, including nylon, for which an interchangeable cylinder fitted with screens is provided. Presumably this is necessary to prevent unfused particles passing through the nozzle, and will be necessary until a "perfect" method of fusion or a "perfect" nylon is developed.

While all this and the so-called high price of the powder (it is of the order of 11s. per lb.) have no doubt deterred many from adventure, it is clear from a consideration of the properties of this thermoplastic that its potentialities are as great as any of its predecessors.

So far as this country is concerned, mouldings have almost all been of a highly "technical" nature—of the complete "fitness for purpose" type. It is indeed right that it should be so, for it is in these jobs where chemical, electrical and mechanical forces are being exerted that the material is proving or disproving itself. It will then follow that what are considered less exigent jobs will be satisfied.

We have often ourselves used the expression "such-and-such a plastic is too good for the job," and it has also been applied to nylon. We do not think that such an argument can hold water unless another "less good" plastic can do the particular job equally well, and unless sufficient supplies are not available. Nylon cups, saucers and plates have been made in the U.S.A., and although we have never seen them, are described as excellent. France, where many industrial nylon components are produced, has also turned out thousands of combs; these were on view at the Paris Fair, and certainly seem the answer to many a maiden's prayer. We all remember that one injection-machine maker at last year's Castle Bromwich show handed out, free, gratis and for nothing, samples of combs to a very delighted audience More than ever are we sorry for the educationalist who is trying to explain plastics to the "man in the street."

On the whole, in spite of the fact that this country is "technically bound," and that it is probably a good thing to work on the principle of "softly, softly, catchee monkey," it is difficult not to regard nylon mouldings with the same excitement that the world thinks of nylon textiles—until, of course, we begin playing with "Terylene"!

MOULDING POWDER AND SHOT

The Food of Love

The "Evening Standard" reports that an enthusiastic Australian buyer at the British Industries Fair has ordered 20,000—repeat, 20,000—plastic ukeleles. Presumably these excellent instruments are of that or similar type and manufacture as was shown on the stand of Selcol, Ltd., at the B.I.F., and at the recent Styrene Products, Ltd., exhibition at 96, Piccadilly; they are made in polystyrene, using nylon strings to produce the necessary plaintive airs. It is hotly denied, however, that the Australians will play all of them at the same time and in the same place—Sydney Cricket Ground—to lull our next Test team into a false sense of security.

* * *

Tale of a Shirt

Strange things happen in this world of topsy-turvy economics. Dr. Calvin Schildkrecht, of the General Aniline and Film Corporation of New York, was recently in this office searching for information of British activities in the field of the "vinyl" resins. He was wearing a shirt of Terylene, the new synthetic fibre made in the U.S.A. by Du Pont's, presumably under British licence. He told me that the U.S.A. is very enthusiastic over the fabrics made from Terylene, and that they are readily available. He has had his shirt for some time, which is very strong and needs no ironing. It's a bit infuriating to remember that although Terylene was discovered by the Calico Printers' Association in this country and that it has been developed and manufactured by I.C.I., Ltd., we have not seen even the tail of a shirt here. No doubt shortage of steel and raw materials generally has prevented large-scale production hitherto However, the recent news that plans for expansion are complete and that Dr. Caress is to be "O.C. Operations" makes things much more hopeful.

* * *

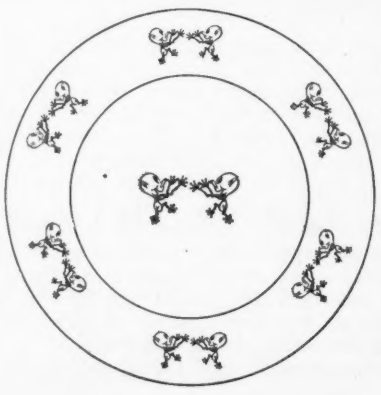
Terylene Filters

Some of the worst conditions of acid corrosion exist in the field of electro-deposition of metals; hence it is here that plastics have received much attention in the fabric form. At a recent meeting of the Electro-Deposition Technical Society, N. Parkinson, M.Sc., described the production of the new tin-nickel deposits and the use of filter-cloths. The electrolytic solutions were strongly acidic, hydrochloric and hydrofluoric acids being present. It has been found that the new synthetic fibre Terylene is most suitable for the purpose, both for filtration of the electrolyte and for the "bagging" of all the anodes. With polyvinyl chloride trouble has been experienced with the leaching out of plasticizers, presumably following hydrolysis, while nylon is rapidly degraded.

* * *

Oh! You Beautiful Bug

The Council of Industrial Design suggested some months ago that pictures of "invisible" molecules or, rather, their crystal structures built up from X-ray and other analyses of, for example, hæmoglobin, insulin, etc., could form the basis of new designs on plastics, fabrics, linoleum, and so on, for the Festival of Britain. Some interesting examples have already been produced on laminated sheet and p.v.c. To assume, however, as some have, that the use of the "invisible" is an entirely new idea is to affront the excellent (admittedly little known) work in the bacteriological field of my friend Philo (Wimseycal) Bones, the famous detective, whose acquaintance you may remember I first made (vide "Plastics," September, 1945, p. 433) in connection with the singularly horrible Mystery of the Crimson Rings. He had been on a strange case of poisoning with tomato sauce, and during his microscopic work had discovered a new septet form of a capsulated diplococcus. He drew it for me (see below) and also presented me with his waistcoat, which had been decorated with the design tastefully interspersed with tomato-coloured splashes. There is little doubt, you will agree, that here is a field of great potential for the creation of new forms of art yet undreamed of by the artist. My own choice would be a theme on the flagellated bacteria introducing the changes that are produced by plasmolysis.



DOGSBODDY.

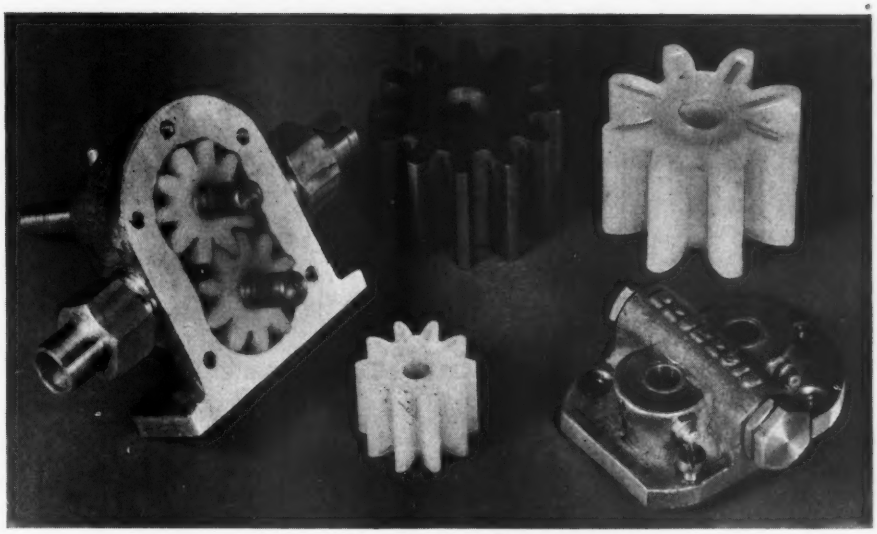


Fig. 1.—Nylon gear-wheels of impeller pump.

Moulding in Nylon

With special reference to the work in this field of Punfield and Barstow (Mouldings) Ltd., the well-known injection moulders.

WHILE nylon is now a household word throughout the five continents as a synthetic filament for the production of fabric, bristles, fishing line and rope, it is almost completely unknown to the public as a moulding material. Yet to the moulders who have studied its characteristics and have produced moulded units from it, and, one should add, to the users of such units, it opens up still newer fields to our industry as ever did any of the older plastics in their turn and time.

The reason is not far to seek. In nylon (and we shall refer only to one moulding type for convenience, although, as is well known, there are several) we possess a thermoplastic with exceptional toughness, strength and hardness, resistant to abrasion and torsion and excellent stability at high temperatures—the normal nylon moulding powder available in this country will withstand distortion up to 200 degrees C. Furthermore, it is light in weight (sp. gr. 1.14), resistant to dilute acids and highly resistant to both weak and strong alkalis. It is quite non-inflammable, possesses good electrical properties, has an exceptionally low coefficient of friction and high elongation without change in tensile strength at high temperatures.

Among the present moulders that specialize in working nylon, Punfield and Barstow (Mouldings) Ltd., of London, N.W.9, claim to be the first to mould the material in Great Britain, having produced their first samples in 1940. The intervening period has been occupied in making a close study of the above characteristics and more especially of the moulding technique involved and the company now produce a very wide range of nylon units.

It was, therefore, with special pleasure that we accepted Mr. Punfield's invitation to visit his works and to see the progress made.

It is also well known that nylon moulding powder will absorb moisture readily and that its effect can be serious or at least can introduce complexities. At these works this problem is kept to a minimum by the use of relatively small, sealed tins of nylon (the moisture content is constant at about 0.8 per cent.) and moulding is arranged so that the whole contents of each is used in one run before another is opened. Where large hoppers and large quantities are employed it would be necessary to control moisture content by preheating or circulating hot air within the hopper. It is known that the lower the moisture content the greater the elongation without change in tensile or impact strength.

Fig. 2.—Part of the Punfield and Barstow injection-moulding shop showing two 3-oz. Windsor machines in the foreground and at the back, a 4-oz. Windsor and an 8-oz. Reed-Prentice machine.

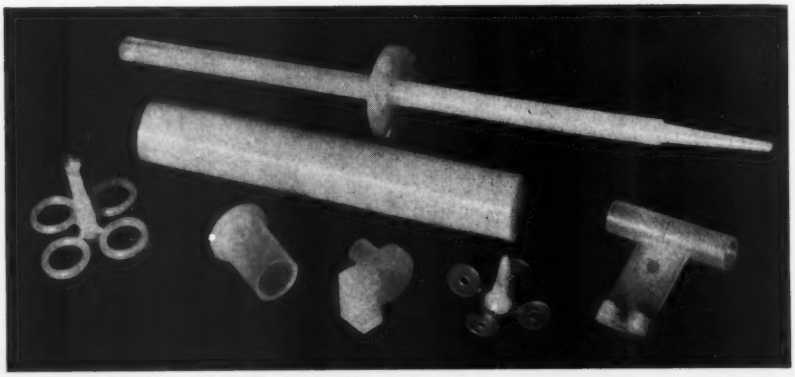
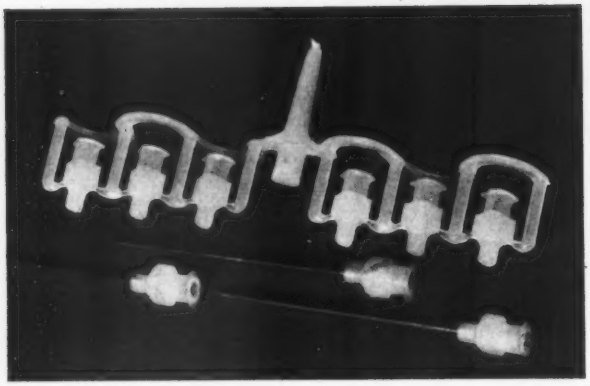
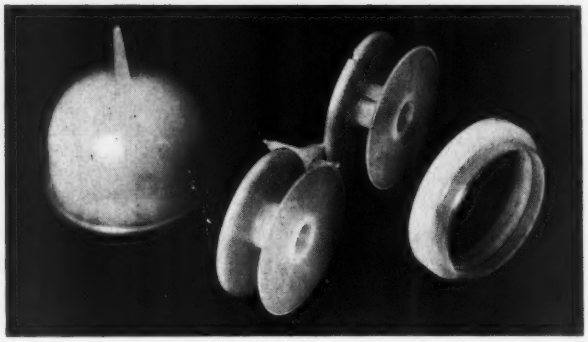


Fig. 3 (right). —Some nylon components showing (top) switchgear index shaft, (centre) extruded rod for machining and making prototypes, and (bottom, l. to r.) four rings, three insulator units and traverse guide with tungsten carbide insert.

Fig. 4 (below, left).—Moulded nylon hobs for hypodermic needles.

Fig. 5 (below, right).—Further mouldings including a hemispherical cup employed in surgery, bobbins and a hydraulic gland seal.





At this point it must be stressed that this relatively new moulding material has presented to the nylon manufacturer, and, in consequence, to the moulder, a series of problems which have entailed greater difficulties than any other previous moulding material. Indeed, some remain only incompletely answered. The fact that moulding must be carried out at temperatures as high as 265 degrees C. presents in itself no great difficulty. On the other hand, at this temperature there is no gradual change to a highly viscous form, but a rapid change to a very fluid one, and too high a temperature entails a danger of deterioration.

Too low a temperature can result in the injection of unfused and therefore unmixed particles, and therefore close-temperature control from the cylinder to the nozzle is of vital importance. A wide variation of moulding temperatures can result in a wide variation of shrinkages.

It is thus clear that in solving many of the difficulties that confront the nylon moulder, he has also learned to take advantage of them and to attain deliberately such variations in the properties of the material as are apposite to specific jobs.

Practically the whole of the components moulded from nylon in use in this country are of the strictly technical type.

It is noteworthy that nylon is the most expensive of all moulding materials, but in view of the advantages gained by its use, this is not a factor which deters the knowledgeable. If one considers the relative specific gravity and cost of many of the non-ferrous metals, it often proves economic to use nylon. Whilst supply of the moulding powder is limited, it is thought to be sufficient for present demands.

The works of Punfield and Barstow (Mouldings), Ltd., contain a large variety of injection-moulding machines, with capacities ranging from ½ oz. to 8 oz. Three new machines for intermediate capacity, two 3-oz. and one 4-oz Windsors, have recently been installed. All have been modified to mould nylon as well as acetate, polystyrene and other thermoplastics, which form the bulk of the raw material used by this company for the production of a host of units ranging from ball-pen bodies to accumulator cases, from toys to intricate electrical units.

A classical case of nylon moulding here is that of gear wheels, and that made for Excelcis (Engines and Gears), Ltd. (and seen in Fig. 1) is typical. It forms the driving mechanism for the small, phosphor-bronze impeller pump, the gear being 1.35 in. overall diameter and 1 in. thick. At the top of the photograph is a large type with the metal "forebear" it has replaced, with complete advantage so far as efficiency is concerned. The metal gear weighs 1 lb. 2¾ oz., while the nylon one weighs 2¼ oz. and, moreover, needs no lubrication whatsoever. The plastic type, with its low coefficient of friction, is suitable for light loads at high speed or heavy loads at low speed.

As we have already noted in the past, nylon is exceptionally suitable for use in surgical instruments, not only because of the strength and resilience of mouldings made from it, but because of the ability to sterilize them at high temperatures. An excellent example is production of nylon hobs holding the hypodermic needles in the instruments, marketed by Ballbrook Surgical Instrument Co., Ltd. Resilience of the nylon prevents breakage of the needle if accident forces it against a hard object.

Of special interest is the conviction by the technicians that nylon will find many outlets in the field of textile machinery. In this field is the moulded unit (see Fig. 3), which is provided with a tungsten carbide insert. This unit, termed a traverse guide, is used in automatic spinning machinery.

The tale of productions at this factory include valve seats and pump seals, electrical bobbins, and the like, and also a number of Ministry of Supply jobs of which details cannot be given for obvious reasons.

The company also produces nylon mouldings in colour by a special dyeing process, both for decorative purposes and in electrical and other mouldings for identification purposes.

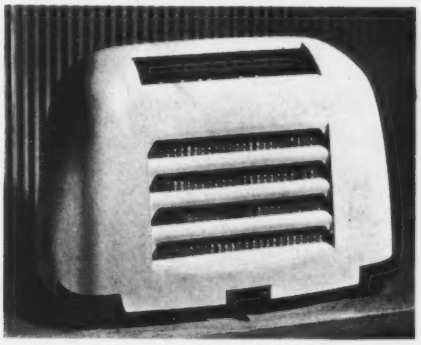
Finally, we beg to thank Mr. Norman Punfield and Mr. Sidney Thompson for their assistance in the compilation of these notes, and for their patience in explaining the details of the new methods of moulding outlined above.

Plastics at the 1951 B.I.F.

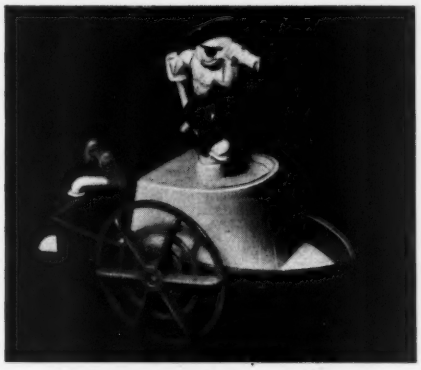
WHILE the area of the Plastics Section at the B.I.F., and the number of exhibitors, have diminished greatly in the past two years, this diminution cannot disguise the tremendous and growing vitality of the industry. The flood of new ideas and new applications grows steadily; quality and design improve yearly.

What is also noteworthy is that the displays on most stands are clearly better than in previous years. Certainly the Federation stand, which had increased the number of its "windows" so that the productions of 25 of its members were seen, gave greater scope, for the size of each had been made larger. Individual members had taken advantage of this, but also avoided last year's errors of overcrowding with moulded and fabricated examples, when little wood could be seen for the trees. The merit of the 1951 Federation stand lay in a realization of this and the change to one of comparative simplicity which brought clarity. This improvement was also seen on the stands of those "die-hards" whose good results last year had convinced them that separate large stands were suitable to their purpose.

The most outstanding moulding of the year was undoubtedly the 32-lb. television console cabinet moulded in "phenolics" for Sobell by British Moulded Plastics, Ltd., not only because of its impressive size and excellent workmanship, but also because of the design. It was, however, seen only at the Birmingham show and not at Earl's Court, for it could scarcely be accommodated in the company's "window" there. It was most comforting to see it, and to see also the exhibits at the stands of Ekco and Kent Mouldings, which showed that the radio and television industry has far from



Kolster-Brandes radio cabinet in urea, moulded by Kent Mouldings.



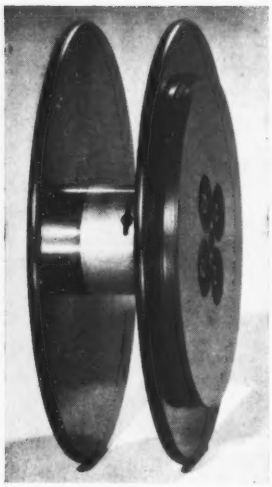
Mechanical pirate boat toy by Rosedale Associated Manufacturers, Ltd.

Polystyrene ukelele made by Selcol Products, Ltd.

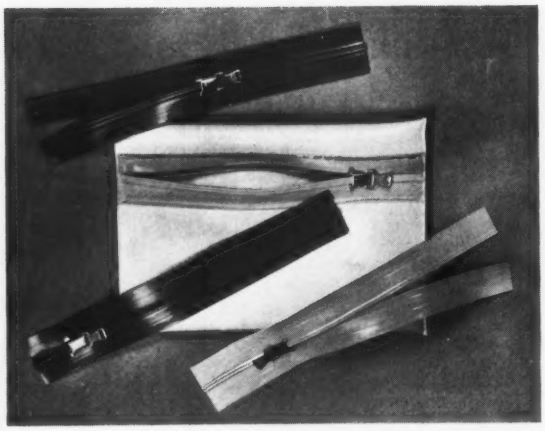
"Bovril" display stand in urea, moulded by Thermo-Plastics, Ltd.

32-lb. Sobell television console moulded by British Moulded Plastics, Ltd.

A selection of display stands by Thermo-Plastics, Ltd.

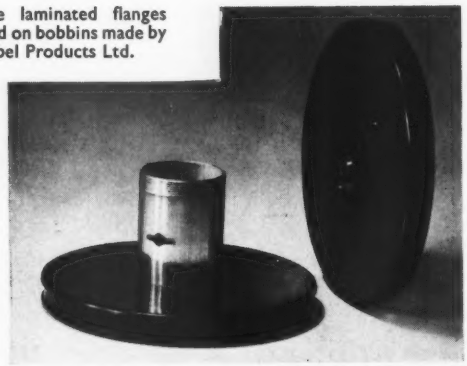


Bakelite laminated flanges are used on bobbins made by Stabel Products Ltd.



Sachet incorporating an extruded p.v.c. slide fastener made by the Flexigrip Co., Ltd.

Jerkin made up from supported p.v.c. material manufactured by Dermide Ltd.



Spare-end bobbin by Stabel Products Ltd.

P.V.C. sheeting with "damask" effect, by Vinatex Ltd.

diminished its demands on the plastics industry.

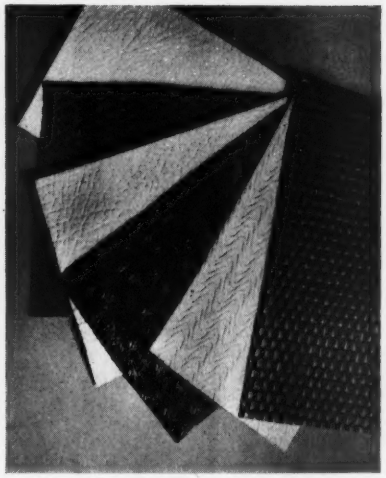
Another product of outstanding merit was that on the stand of Thermo-Plastics, Ltd. It was a complete etching plant for the photo-engraving industry, fabricated in rigid p.v.c. by this company. As an acid-resisting structure for the acid etching of metal printing plates, replacing the old earthenware types, this is a great advance.

Of novel interest, too, was the two-colour moulding carried out by Ebonestos Industries for Merryweather fire-fighting equipment. It consisted of a black phenolic disc used as a name plate with the wording in red. This type of double moulding has long been talked about, but rarely executed. Especially fine mouldings were also exhibited by Halex, Ltd. (phenolic moulded components for washing machines, and berth light fittings), Universal Metal Products, Ltd. (vacuum cleaner nozzle in acetate-butyrate), and Injection Moulders, Ltd., whose scope for injection increases steadily and who showed a set of "Diakon" mouldings for the housing of the "Kub" electric shaver, an intricate radio cabinet for Kolster-Brandes and a polythene sphere for an electrical component.

Handbag made up from "pig-skin" leathercloth by Dermide Ltd.

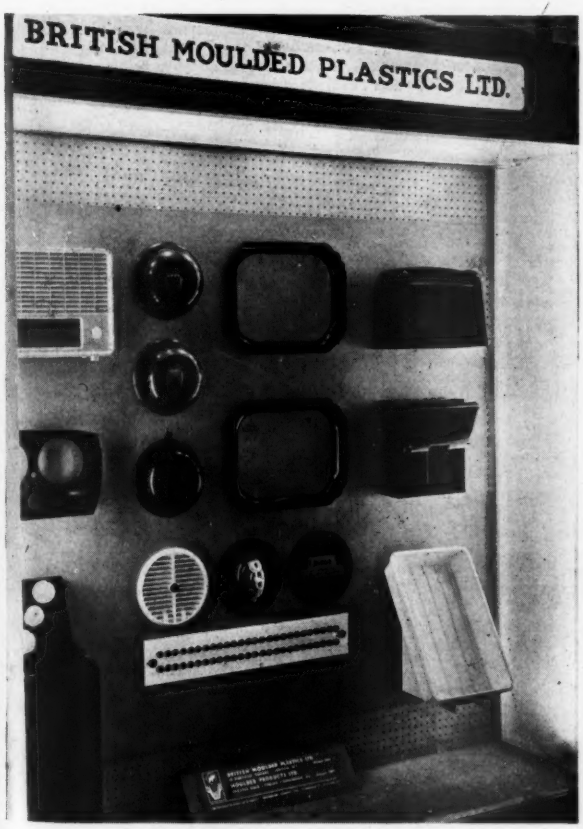
An especially beautiful exhibit was that of Runcolite, Ltd., showing melamine plates and trays with delightful coloured designs, especially produced for the Festival of Britain Thermo-Plastics, Ltd., also continue strongly on their display stands and advertising units.

Polyvinyl compounds in sheet and other forms were also strongly represented. Vinyl Products, Ltd., have gone very much ahead with their mould making compounds for artistic and other castings, while Vinatex, Ltd., Greenwich Leathercloth Co., Ltd., Arlington Plastics Development, Ltd., Duraplex (Plastics), Ltd., Kenverne, Ltd., Dermide, Ltd., and Wallington, Weston and Co., Ltd., have produced a vast range of p.v.c. sheeting, embossed and printed with excellent designs and colours.

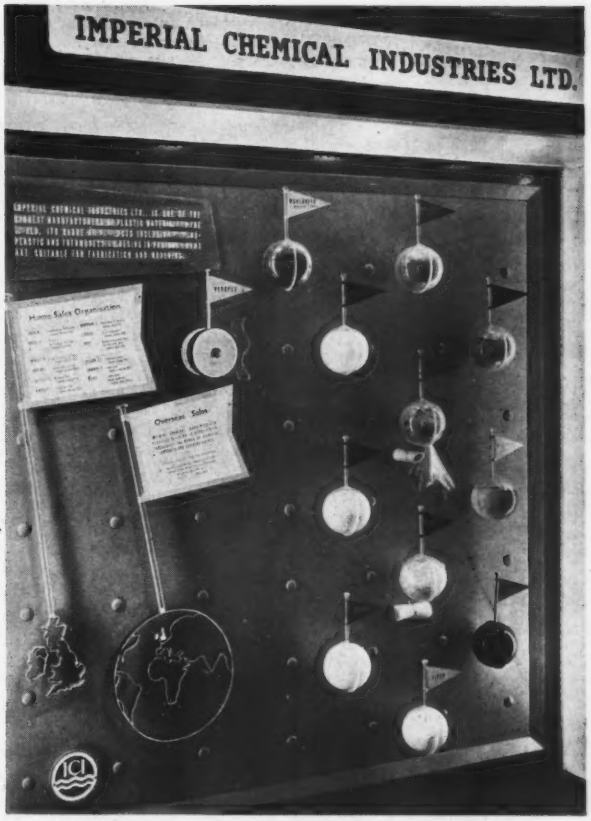


Embossed p.v.c. sheet by Vinatex Ltd.

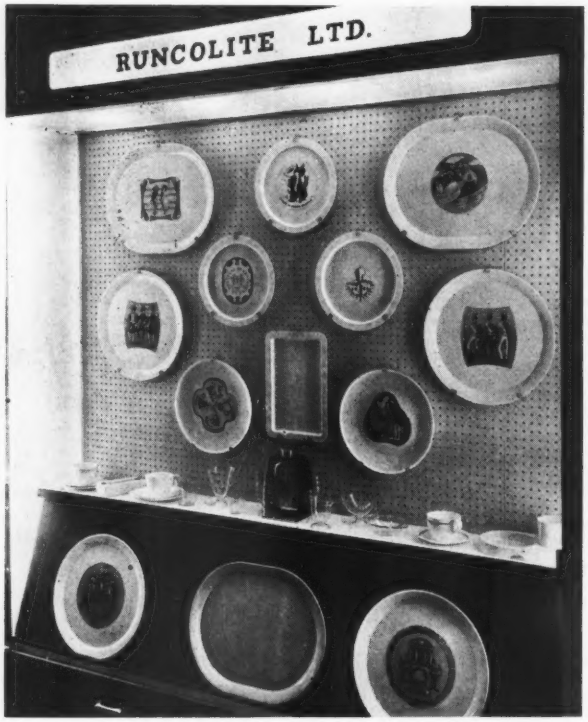
On this page and the five following pages we reproduce photographs of the exhibits of 25 member-firms of the British Plastics Federation, which provided a combined display in the Plastics Section of the Fair at Earls Court. The panel shown above emphasizes the fact that plastics are capable of meeting all needs, irrespective of whether a moulding be large or small, simple or complex, practical or decorative, serving light or tough uses. Further illustrations showing other stands at Earls Court and at the Birmingham Section of the Fair will be published in our July issue.



A small selection of trade mouldings showed examples in many materials, including a refrigerator drip tray in polystyrene, a dispensable oxygen mask for high altitude flying moulded in polythene, airport landing lights in polystyrene, etc.

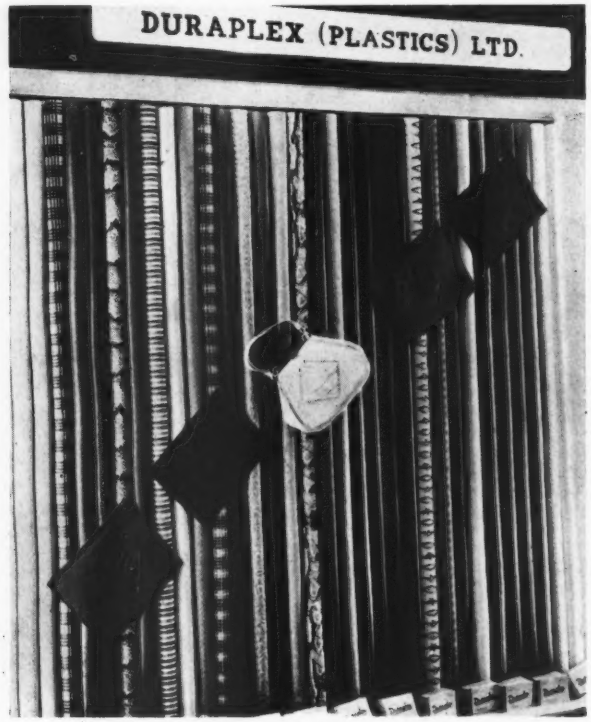


Showing only raw materials, the display emphasized the world-wide demand of products of the Plastics Division. Materials include acrylic sheet, phenolic and urea moulding powders, polyvinyl chloride resins compounds and pastes, polythene, polytetrafluorethylene, nylon, terylene, etc.

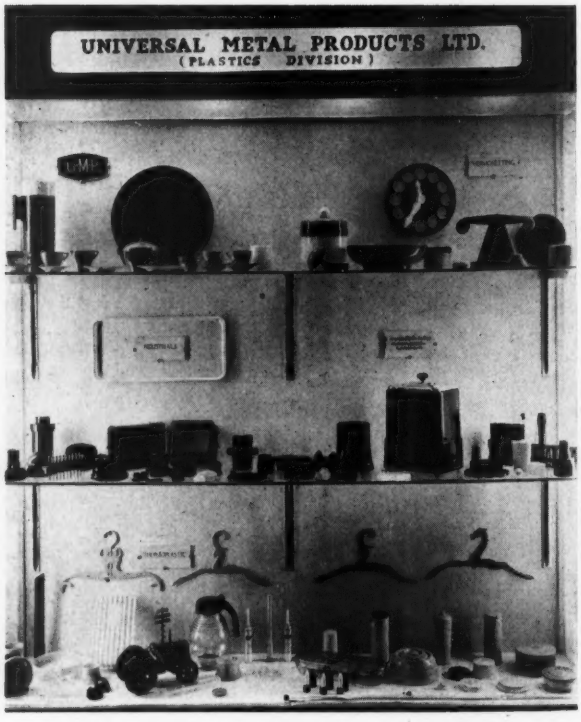


Well-known artists and designers have been commissioned to make use of a new decorative technique (described in "Plastics" 1950/Oct. Nov. Dec./270) for a Festival of Britain range of melamine trays. Acrylic tableware was also exhibited.

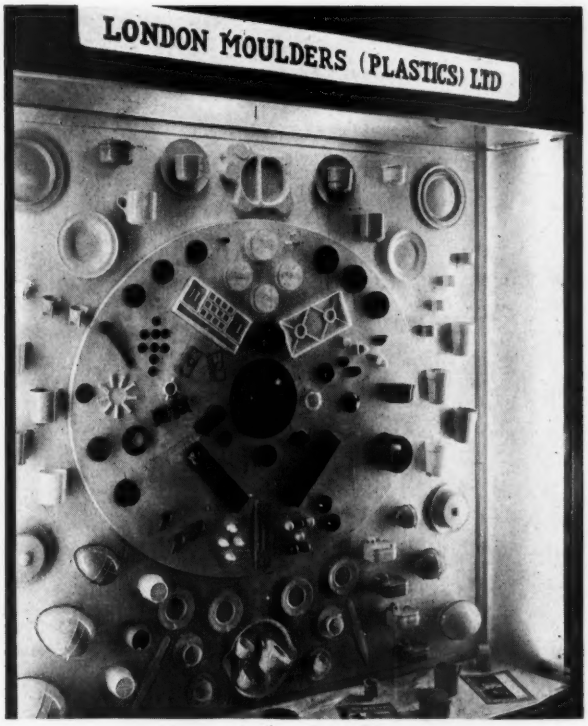
Experience gained in moulding radio cabinets and accessories for their own and other radios has been used in making large injection-moulded components for refrigerators, such as the breaker strip, meat tray, drip tray and ice-cream cabinet door for "Frigidaire."



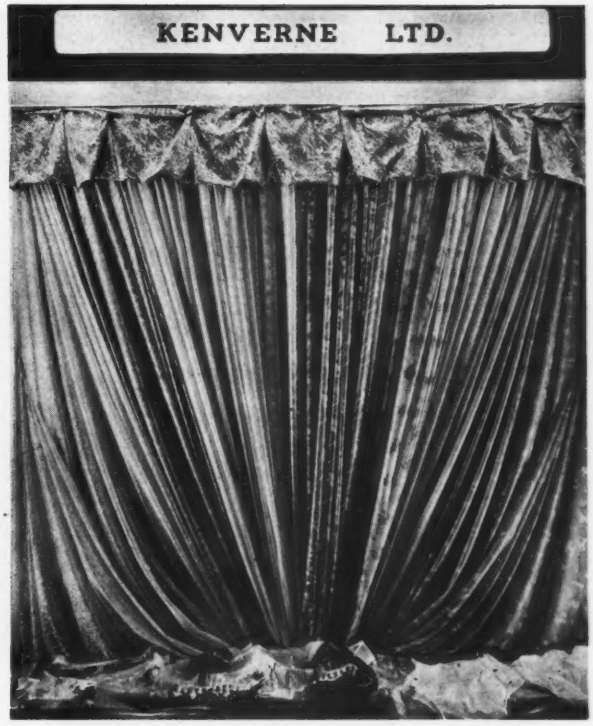
Unbacked p.v.c. sheeting finds a main outlet in the bag trade. The large range of colours and surface finishes includes deep panel embossings with large floral designs.



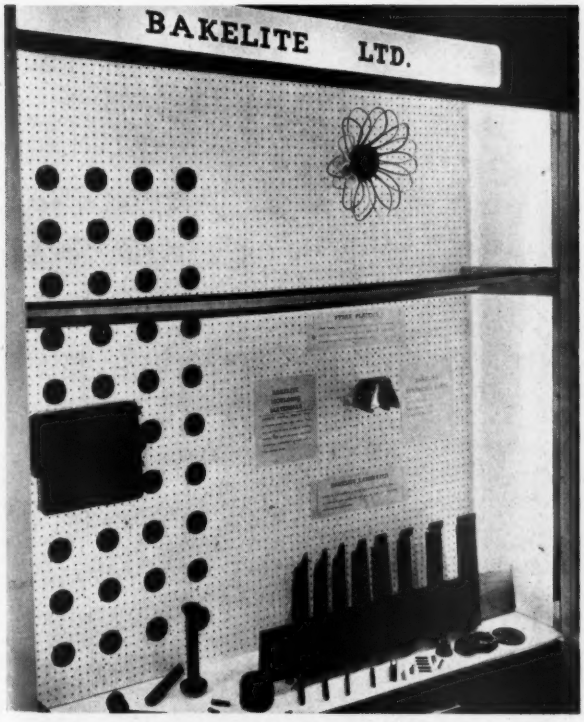
Equal emphasis is given to trade and proprietary products, injection and compression moulded, including a vacuum cleaner nozzle in Tenite II (cellulose acetate butyrate), a replica model of a David Brown tractor and a new tea set.



Surrounded by the proprietary mouldings made by the company—mainly domestic ware and toys—is a special panel showing trade mouldings which include electrical components, cosmetic containers and closures



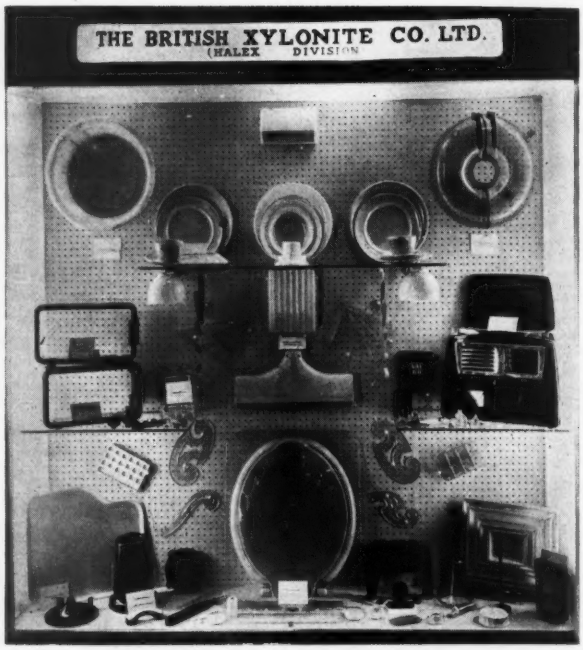
Plain, printed and silk-screened p.v.c. sheeting was shown by this company, together with some of the articles made from them such as table cloths, baby pants, and other articles of clothing.



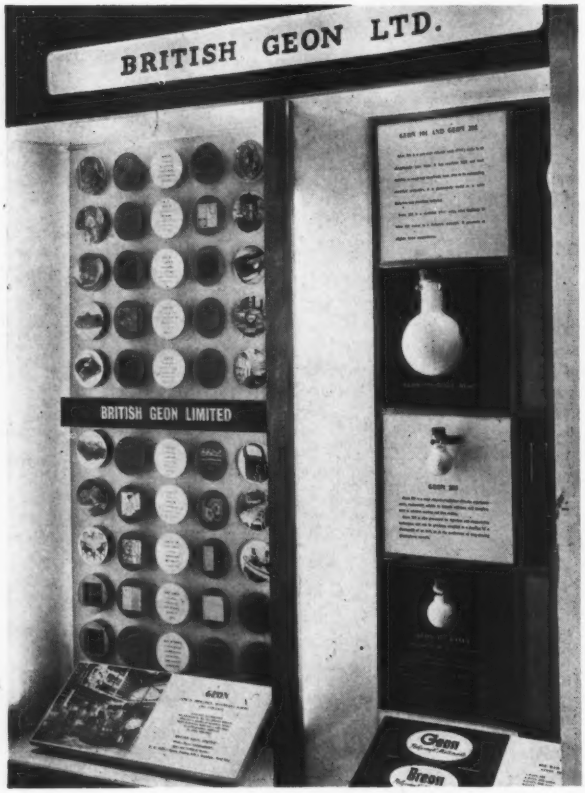
This simple instructional display indicates, with a minimum of detail, the activities of the company in the production of synthetic resins for paints and varnishes, of phenolic moulding materials, laminated sheeting and of vinyl extrusion and moulding compounds.

Latest activity of this versatile company is the extrusion of polythene lay-flat tubing for packaging. Other products shown are cellulose acetate boxes, injection-moulded containers, flexible bottles, toys and p.v.c. clothing.

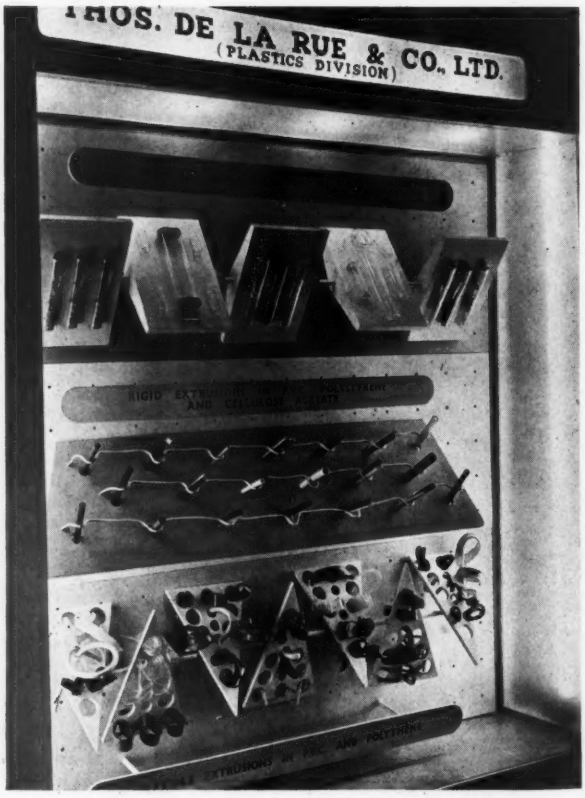
This special display does not attempt to show the full range of "B.X." plastics but is confined to demonstrating "Saran" yarn made from polyvinylidene chloride supplied by the Dow Chemical Co., of America, and used in the weaving of "Tygan" material by Fothergill and Harvey, Ltd.



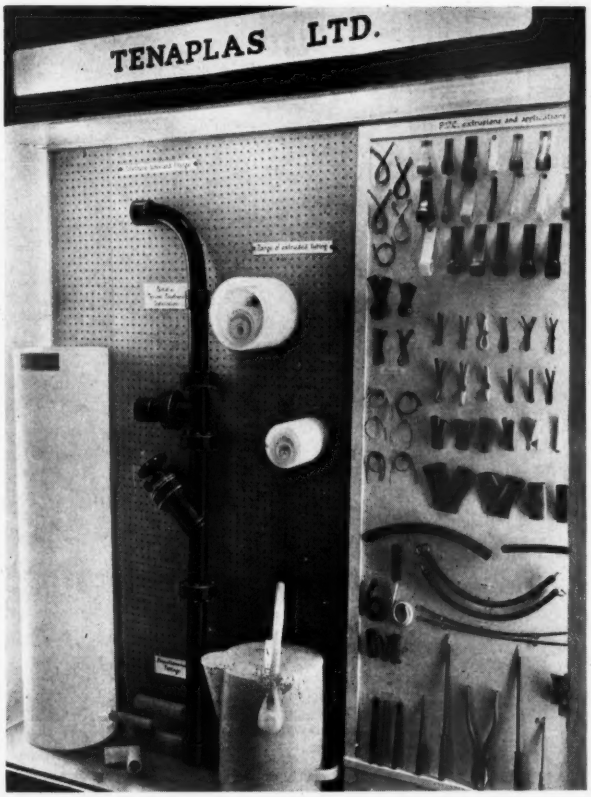
The trade mouldings of this company are given pride of place here. These include a new injection-moulded cellulose acetate lavatory seat, polystyrene drawing instruments, a portable Pye radio cabinet, bottle seals, phenolic components for a washing machine, etc.



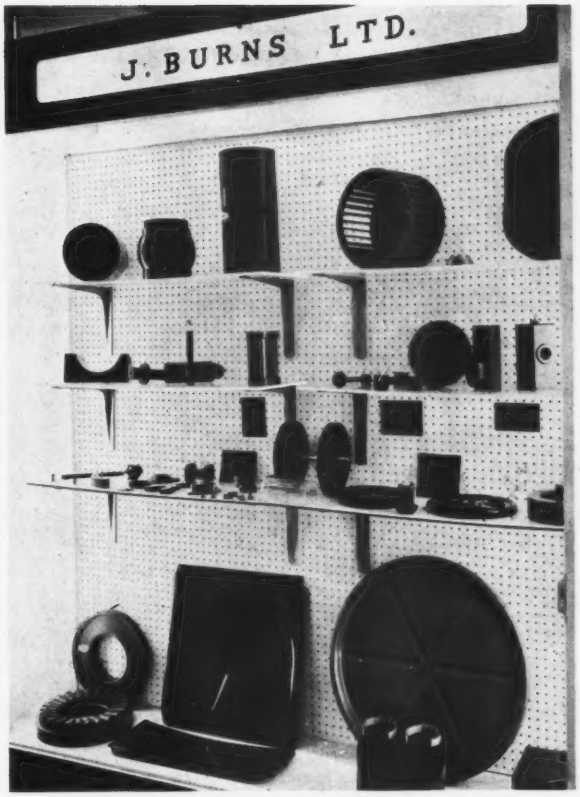
Whilst the right-hand side of the panel shows samples and indicates properties of various "Geon" and "Breon" polyvinyl materials, the left-hand side shows finished goods and their applications.



Specialities of the extrusion side of the plastics division are rigid, transparent, seamless containers and rigid polystyrene, p.v.c. and cellulose acetate extrusions. Flexible extrusions in p.v.c. and polythene are also manufactured.

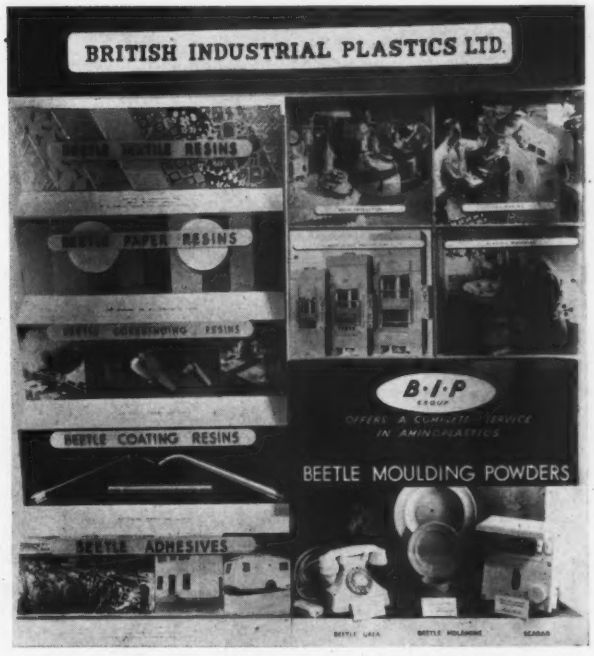


The exhibit had two parts: the first—devoted to polythene extrusions and fabrications²—showed part of an installation of polythene tubing with flanges, joints, T-pieces and valves, the other half showed a very large variety of p.v.c. extrusions and their applications.

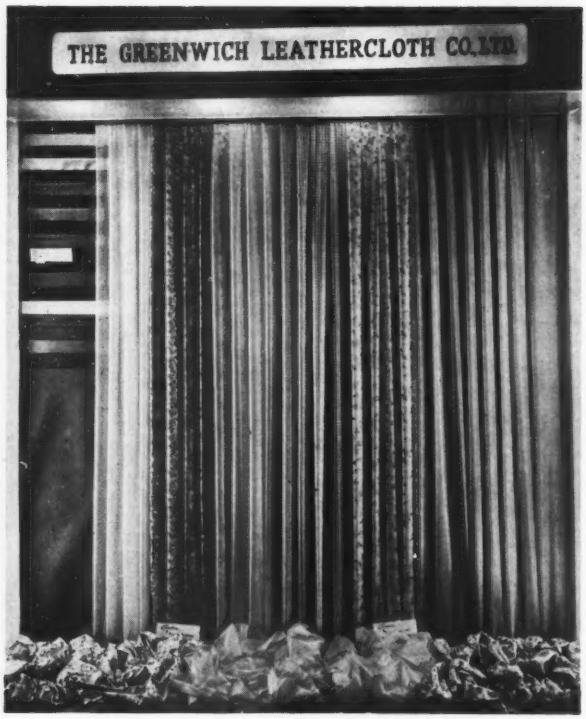


Machined and shaped components of synthetic resin-bonded laminates made by this company were selected from all industries. Among examples shown were bearings, gears, trays, chair seats and engraved plaques.

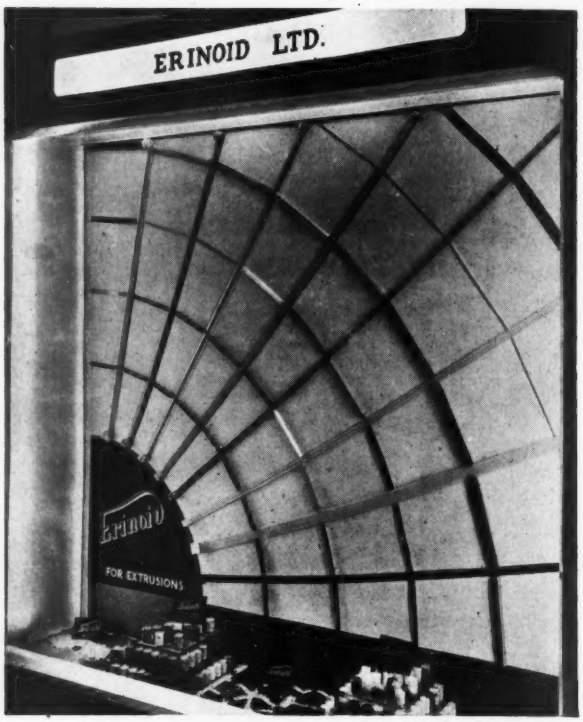
A profusion of compression mouldings, injection mouldings and fabrications from micanite were displayed by this group. New examples included a two-colour moulding for Merryweather fire-fighting equipment, and a Festival perfume pack.



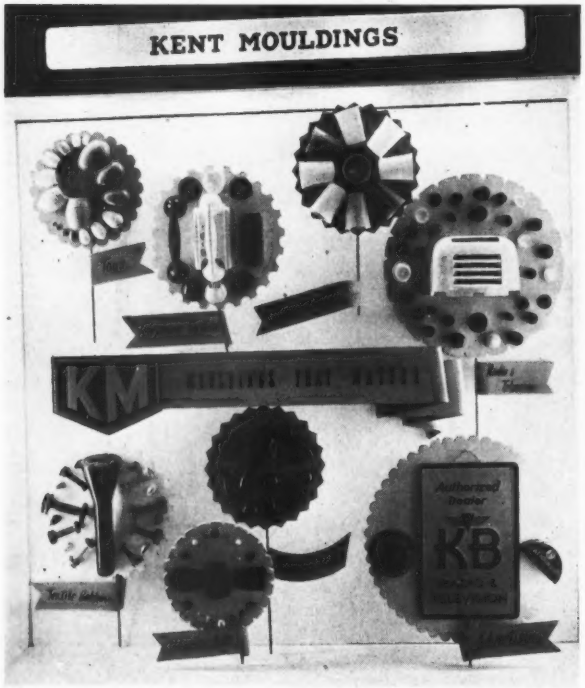
This pictorial panel demonstrates the widespread activities of the B.I.P. group in the manufacture of plastic materials, moulding presses, moulding tools, and finished mouldings. Other "Beetle" products are used in paper, textiles and for metal casting cores.



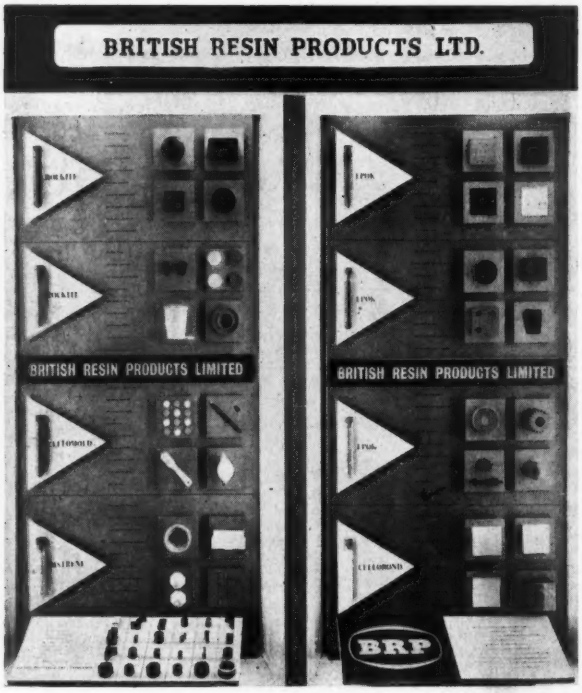
The display of "Craylene" plain and printed p.v.c. sheeting in many colours and patterns was supported by a selection of "Duranide" cloth-backed p.v.c. leathercloth for upholstery and similar purposes.



Main feature of the Erinoid panel was an attractive display of p.v.c. and cellulose acetate extrusions. Minor emphasis was given to casein, cellulose acetate, polystyrene and p.v.c. sheet and to cellulose acetate and styrene moulding powders.



A neatly designed stand showed the applications of the compression mouldings of this company to toys, telephones, domestic articles, radio, textile bobbins, hearing aids, tool handles and advertising displays and novelties.



Moulding powders in phenolic, urea, cellulose acetate and styrene materials as well as coating and bonding resins and thermosetting extrusions were demonstrated in this panel.

Plastics in Building—IX
Illumination and Lighting Fittings

By JOSEPH B. SINGER, B.Sc.(Arch.), A.R.I.B.A.

GOOD illumination of buildings has to satisfy conditions for visual requirements, it must give a high order of comfort, have a stimulating effect and, lastly, it has to impart atmosphere conforming to the character of the building. Certain types of illumination, such as low brightness and diffused light, produce a different emotional state from that of high brightness and sparkle. Another important aspect which has to be considered is the avoidance of excessive brightness, or glare, affecting the vision detrimentally owing to the inability of the eye to adapt itself to widely different and contrasting conditions of illumination value.

The first lighting fittings in plastics were produced from amber and darker-colour phenolics. The real progress of plastics in lighting, however, began with the advent of ureas. "Beetle" lighting bowls were originally produced in 1936, and almost-white and pastel-tinted lamp shades then became available. The material used was found to be a good diffuser of high-reflective and light-transmission properties, but in spite of these advantages ureas had the drawback of necessitating special shapes for the bowls to protect the material against exposure to excessive heat from electric bulbs. The introduction of melamine has now overcome this difficulty and has improved the heat resistance of shades.

Among thermoplastics, cellulose acetate, acrylics and polythene are used for lighting fittings. Cellulose acetate fittings and shades are comparatively low in cost, and are manufactured in various degrees of translucency and a range of finishes. The main advantages of acrylic fittings are their exceptional clarity, good diffusion and resistance to shattering. Apart from the ease of forming and shaping, the material possesses inherent gracefulness and lightness that lend themselves to the production of attractive designs, but some fittings on the market lack these qualities and appear to be somewhat clumsy. Polythene lamp shades are better known under the trade name of "Crinothene"; this material, produced by I.C.I. Plastics Division, has a pleasing surface with rippled texture of different colours.

Experience extending over a number of years has proved the suitability of plastics for lighting fittings, and has established their merits in comparison with other materials. Generally, such fittings are lighter and less fragile than glass; they are not easily shattered and present less risk of breakage alike in transit and use.

The design of lighting fittings is determined by several factors. A certain amount of light, usually 25 per cent. but often as much as 50 to 60 per cent., has to be emitted upwards. A certain amount has also to be emitted sideways to illuminate the walls and relieve shadows, but the source of the light should be screened from direct view. Materials and arrangement of shapes which enable the brightness to be diminished toward the edges of the fittings, against the background, give better results for emission of light in a lateral direction. In this respect, "Crinothene" has been found most satisfactory, due to its "rough" surface and slightly "milky" appearance; this material has also the advantage of repelling dirt. The angle of cut-off, which controls the

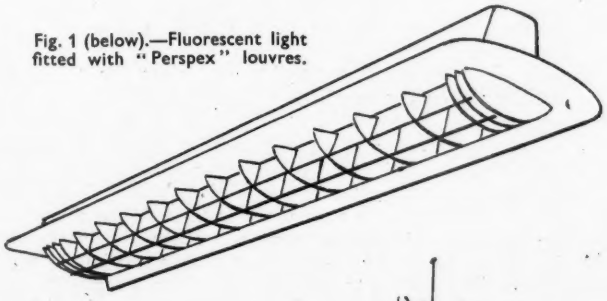


Fig. 1 (below).—Fluorescent light fitted with "Perspex" louvres.

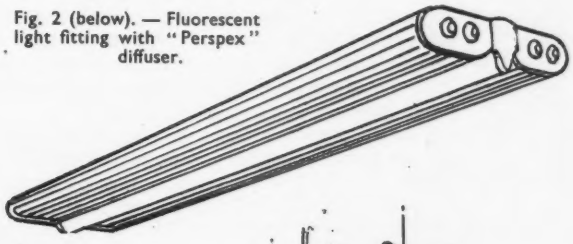


Fig. 2 (below). — Fluorescent light fitting with "Perspex" diffuser.

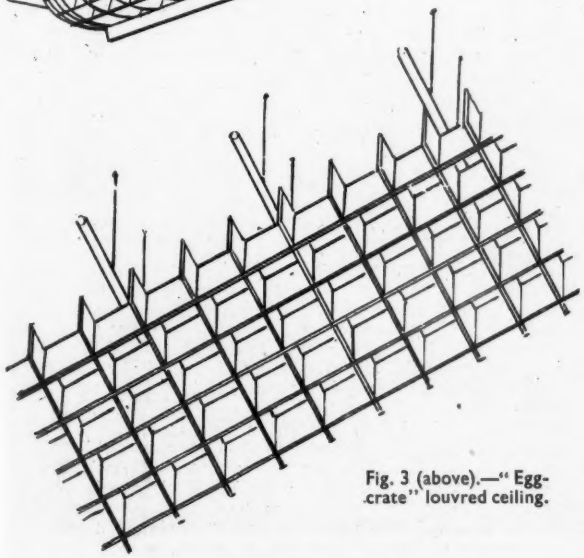


Fig. 3 (above).—"Egg-crate" louvred ceiling.

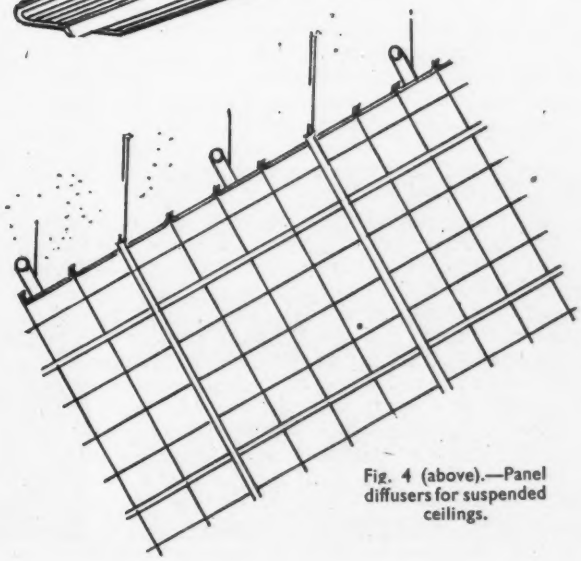


Fig. 4 (above).—Panel diffusers for suspended ceilings.

amount of light falling downwards, should be not less than 45 degrees, extending to 60 degrees.

Generally, in artificial lighting there are two types of light sources, namely, incandescent and fluorescent, the latter being again divided into hot-cathode and cold-cathode types. Whilst the incandescent source provides better point lighting, the fluorescent source has a superior diffusing quality. Optimum conditions are achieved when "point sources" and "diffuse fields" are used together, although this does not mean that point lighting is exclusively confined to the incandescent source. By combining both types it is possible to obtain indirect lighting, supplemented by direct downward lighting or, alternatively, to have a low general intensity with local point sources where required. The first combination allows the installation of lighting fittings close to the ceiling for decorative purposes, made possible by supplementary indirect lighting which reduces the contrast between a darkish background and the brightness of light sources at the ceiling. In the second combination, the direct light is brought below the eye level in the form of table standards, e.g., for offices, restaurants, etc.

Another method which utilizes the principle of combining direct and diffused lighting is seen in the louvred type of ceiling. The "egg-crate" arrangement, built up from crossed translucent louvres which are suspended from the ceiling, is installed below the source of the light. In America, such louvres are produced from cellulose acetate, either white or coloured. They are manufactured in thicknesses from 0.04 to 0.06 in. and the recommended size of cells is 2 ins. by 2 ins. by 2 ins. Although larger sizes are possible, this standard size makes the lighting fixtures and the ceiling almost invisible. Fluorescent tubes are found generally to be the best source of light, their spacing being three times the distance from the louvres.

The same principle, on a smaller scale, is being applied to single fluorescent tubes, using "Perspex" louvred diffusers in a variety of designs. In both cases, the louvres cut out the glare-producing rays, and the amount of absorption and diffusion depends upon the colour of the shades. The use of black louvres is suggested for positions, such as theatre aisles, where direction of all the light rays towards the floor is required. Melamine and urea could be used for louvres with incandescent lighting.

The diffusing property of polystyrene has found an application in suspended ceilings, which completely screen the fluorescent lighting. Special polystyrene trays, moulded into 6-in. units are welded together to form a large panel, which is framed in wood, light alloy or plastics. These polystyrene panels are comparatively light and are suspended from the ceiling, below the fluorescent tubes. An attractive ceiling, based on the coffer principle, could only be used in positions where diffused light is quite adequate. For single fluorescent fittings, "Perspex" diffusers act in a similar manner, and their diffusion property is increased by the reeded pattern of the surface.

It is a well-known phenomenon that colourless transparent materials are capable of "piping" light invisibly from one point to another. Ordinary glass absorbs the light rapidly and limits its path to a few inches; optical glass and fused quartz are too expensive for commercial use. Acrylic plastics, however, possess this peculiar property to a marked extent and show scarcely any absorption of the light. Further, the acrylic material is easy to machine and engrave, and its thermoplastic property facilitates shaping.

The light which enters the edge of the sheet through an arc of 95.6 degrees is reflected by the polished surface, its incidental angle being equal to the reflected one, until it reaches the opposite edge or point, where the surface has been grooved or disturbed in any other way. This characteristic can be utilized in commercial signs and in mural designs, as best exemplified in "edge lighting." Here the surface of the sheet is sanded, engraved, etched or painted, and the light which enters at the edge escapes through the disturbed surface, thus producing a characteristic glow.

A uniform diffused light is obtained by painting the surface, but more brilliant effects are produced by cutting. There are different techniques of cutting; the "V" profile of cuts gives sparkling brilliance, "U" profile produces a thin highlight from any angle, whilst a square groove has only the sides brilliant. Due to internal reflections, the light escapes through the opposite surface to the disturbed plane, and therefore the design has to be viewed from the side of the polished surface. A greater depth and colour effect is achieved when parts of the design are engraved on successive sheets of material which are bound together to form a transparent laminate.

A wide range of variations is possible by combining engraving with painting, or by using a coloured sheet of material as a background. Thus, a continuous wall panel could be illuminated to provide a soft indirect lighting to the room. The efficiency and success of this type of lighted decoration are determined by several design factors.

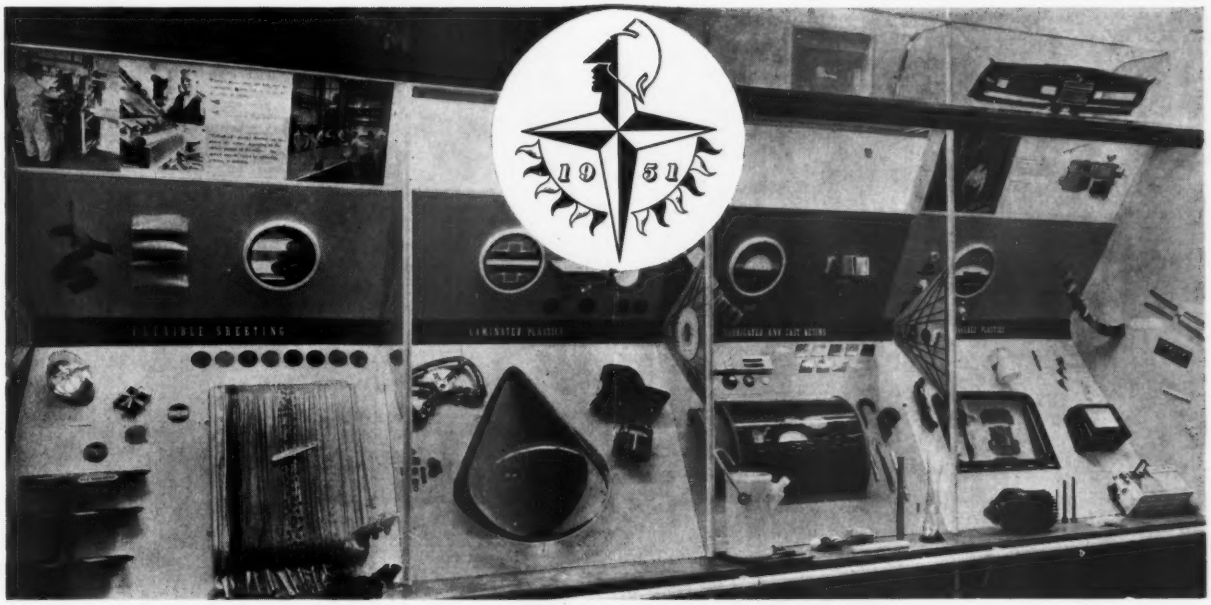
The intensity of the light is inversely proportional to the amount of decoration on the surface. Some colours absorb light more readily than others, and light or white colours are, therefore, recommended. The increased thickness of the sheet limits the area of decoration that can be properly illuminated, since the light rays are reflected more frequently between the surfaces of a thin sheet than those of a thick one. On the other hand, adequate edge area is necessary to obtain good illumination, and the minimum thickness of the sheet will depend on these two elements. It is also important to have the edge polished at right-angles to the surface. Light transmitted from its source travels through the sheet, and that part of the light which is not diffused, escapes through the opposite edge, unless the edge has a coating of opaque white paint which reflects the light rays back into the sheet. Fluorescent tubes are the most suitable source of light, because the heat they develop does not reach a temperature which is detrimental to acrylics, and since the tubes are available in various lengths to suit the design.

There are various ways in which the illumination effect may be improved, and its uniform distribution throughout the surface attained. For instance, two or more edges could be lighted to enhance the brilliance of the sheet. The design can also be planned in such a way as to avoid the concentration of engraved details at any point, particularly close to the source of light. Alternatively, the engraving is made deeper in proportion to the increased distance from the light source. The sheet can also be made to taper, as the distance from the source of light increases, the engraving itself remaining constant in depth.

(To be continued.)

Submarine Water-gauges.

Details of the testing of "Plexiglas" tubes in the water gauges of flooding tanks in submarines and in depth gauges at static and at impact stresses set up by internal pressure, such as may be occasioned by depth charges, comprise part of a report, dated December, 1943, from the materials testing station of Fried, Krupp Germania-werft A.G., Kielgaarden, which can be consulted at the Technical Information and Documents Unit of the Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Ref. F.D. 1013/50). It was ascertained that, contrary to metallic materials, the tubes were destroyed at approximately the same pressures at both impact and static stresses. The superiority of "Plexiglas" tubes over conventional glass water-gauge tubes was clearly demonstrated, but so was also the sensitivity of the former to surface damage. It was observed that a scratch on a "Plexiglas" tube reduced the strength by about 50 per cent. at impact stress.



Plastics at the South Bank Exhibition

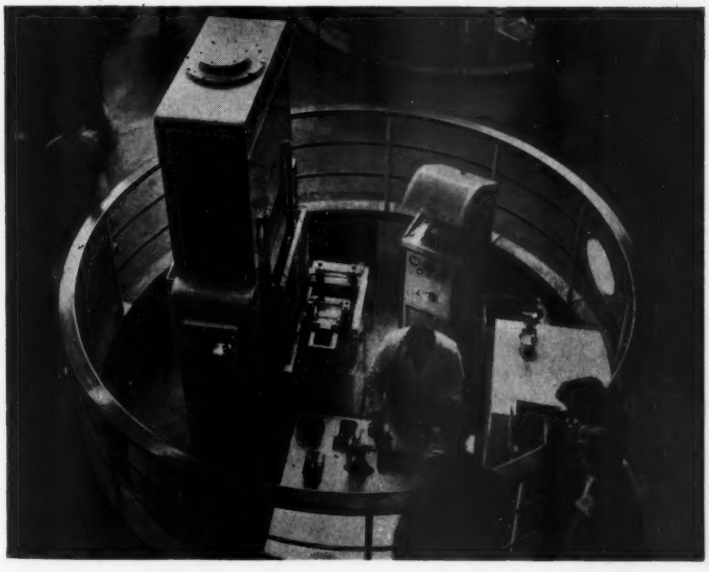
THE South Bank Exhibition—London's centre piece of the Festival of Britain—has been designed to show the nature of the land of Britain and the way of life of its people. The pavilion of Power and Production illustrates the important role of industry in this country, and it is here that the products and achievements of the plastics industry are on view.

There are two principal exhibits relating to plastics. In the centre of the pavilion, where machines of all types are seen at work, a "Bipel" 100 moulding press together with a 3-kW "Radyne" plastics preheater are seen being used to mould phenolic electrical components. Many details such as the action of the time cycle control can be clearly seen.

The products of the industry are shown on a panel (seen above) designed by George Fejér with the co-operation of the Council of Industrial Design and the British Plastics Federation. It shows in four sections, illustrated with diagrams, photographs and samples, the manufacture and use of flexible sheeting, laminates, fabricated and cast resins and moulded plastics.

In other sections of the exhibition, plastics have not been forgotten. In the Homes and Gardens pavilion, for example, there is an attractive display of plastics household goods, and in other sections plastics materials and products are also used.

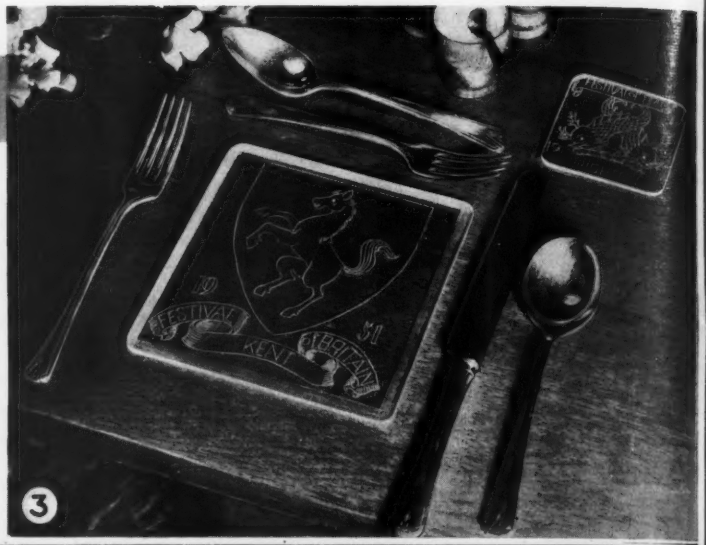
Laminates, extrusions, castings, etc., in all types of plastics have also been used extensively in the actual construction and fittings of the exhibition. An interesting example is the use of laminates and leathercloth with decorative designs based on the X-ray crystallographic patterns of complex crystals such as insulin and hæmoglobin. A novel type of display lettering designed by F. H. K. Henrion has actual objects such as leaves, animals or insects embedded inside the individual letters, which are cast in "Marco" resins.



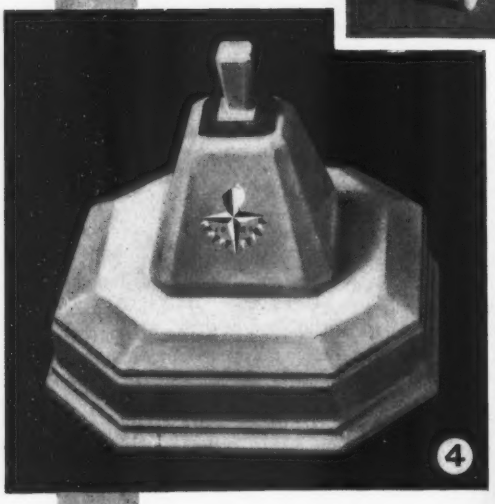
(Left) Moulding press in operation in the pavilion of Power and Production.

(Below) Letters cast in "Marco" resins, with natural specimens embedded in individual letters.

K

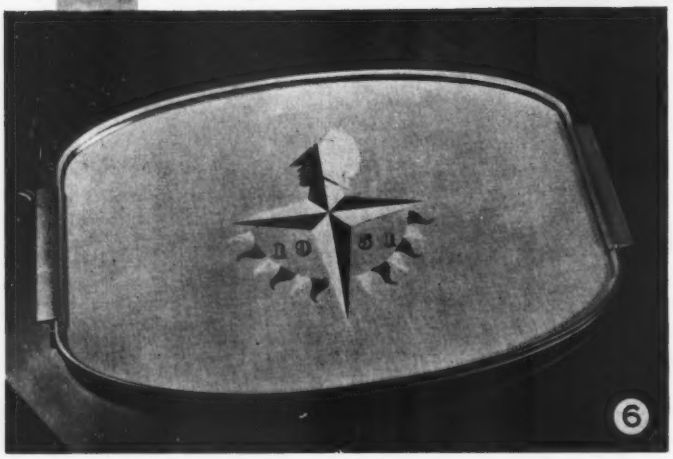


Festival



WHEN plans for the Festival were being made, the Council of Industrial Design asked manufacturers to submit articles suitable for sale in the souvenir stores on the various Festival sites. Most of the plastics souvenirs shown on these pages, and in another selection to be published next month, are taken from this list.

Some of them have been specially produced for the purpose, whilst others are products already on the market, which have been adapted or merely decorated with the Festival



1. Five-inch model of the Eros statue in Piccadilly Circus, moulded in cellulose acetate by Fraser and Glass, Ltd.
2. Paperknife with crest moulded in cellulose acetate by Godfrey Holmes (Plastics), Ltd.
3. "Perspex" table mats engraved with county arms, made by W. Pasmore and G. Westnage, of Brook Green, London.
4. "Falcon" table lighter with "Beetle" urea housing, manufactured by Hillier Engineering Co., Ltd.
5. Pocket mirror with crest on the back, made with celluloid sheeting, by Halex, Ltd.
6. Tray manufactured by Besway Manufacturing Co., Ltd., with Festival symbol incorporated in the "Warerite" base.

Souvenirs

symbol. This crest is seen on many of the productions, moulded, marked in gold or colours, or engraved. Other souvenirs, such as the Nelson column, Eros and the decorated series of melamine trays (of which only one is shown) take their ideas from famous London scenes.

The background to our title is taken from a pattern of "Warerite" sheet based on crystal structure of hæmoglobin, an experiment in design used in the Regatta Restaurant on the South Bank.

7. Magnifying glasses set in cellulose acetate frames, manufactured by Optical Laboratories Ltd.

8. "Jolly Olly," the climbing toy sailor, manufactured by Industrial Music, Ltd.

9. Five-inch model of the Nelson column, moulded in cellulose acetate by Fraser and Glass Ltd.

10. Soap box with Festival crest in relief, moulded in polystyrene by London Association for the Blind.

11. Perfume pack convertible to cigarette case, moulded for Delavelle (G.B.) Ltd. by Mica Products Ltd.

12. Melamine tray with underglaze decoration, showing Temple Bar, one of a series made by Runcolite Ltd.

World's Industry Employs Plastics

GENERAL ENGINEERING

Application of silicones.—I. W. Hutchison reviews the engineering applications of these new materials under the following headings: Fluids and oils, bearing lubricants, compounds and greases, resins and varnishes, silicone rubbers. ("Tool Engineer," 1951/Mar./38.)

Postforming thermosetting plastics.—W. I. Beach writes a series of articles on an improved method of forming laminated plastic sheets. The effects of the process on undercured, normal and overcured forming stock are described as well as the deforming effects of fabric filler ("Machinery" (N.Y.), 1951/Feb./163 and Mar./170.)

A new silicone rubber produced by the Chemical Dept., General Electric Co., Pittsfield, Mass., is said to permit easier moulding and to give improved mechanical and thermal properties. Mechanical parts are said to be fabricated after a warm-up of five minutes. Applications: Diaphragms, belting, hose and mountings. ("Machinery" (N.Y.), 1951/Feb./197.)

Neoprene Rubber Compound (Stalwart Rubber Co., Bedford, Ohio) can withstand concentrations up to 0.003 per cent. ozone for six hours and temperatures from −87 degrees F. to +240 degrees F. This material is used for the grease containers on aircraft universal joints. ("Machinery" (N.Y.), 1951/ Feb./197.)

Phenolic laminate of uniform strength throughout is reinforced by unwoven cotton fibres, laid at random in a mat arrangement. This structure results in uniformity of strength (tensile, impact and flexural) thus making an ideal material for non-metallic gears, cams, textile bobbin heads, etc. Produced by Richardson Co., Melrose Park, Ill, U.S.A. ("Machinery" (N.Y.), 1951/Feb./197.)

Strength of elastomers.—B. T. Blevins and M. G. Defries have developed a nomogram, which avoids the necessity of plotting a curve and measuring its slopes. Results of three calculating methods are compared. ("A.S.T.M. Bulletin," 1951/Apr./59.)

Tolerances for moulded hard rubber parts.—A percentage tolerance system based on accumulated variables inherent in mould distortion, production processes and materials is presented by W. L. Hamevious. ("Product Engineering," 1951/Apr./124.)

Optical stress investigations on gusset plates with openings were made by R. Albrecht on models of Dekorit and Plexiglas. ("Beton and Stahlbetonbau" (Berlin), 1950/279.)

Cold moulding preheated plastics is discussed in detail by J. Dounes, giving a number of interesting examples. ("Toolmaker and Precision Engineer," 1951/Mar./16.)

Application of synthetic glues is discussed by A. Hoechtlen. He deals in detail with cementing of wood, metals and non-metallic materials. ("Kunststoffe," 1951/Feb./53-56.)

High frequency heating in the plastics industry.—General article giving some temperature-time diagrams for the course of high-frequency pre-heating. ("Technik und Handwerk," 1951/Mar./37.)

MISCELLANEOUS

Weather ageing of plastics.—S. E. Yustein and coll. have investigated the effects of five years of outdoor weather ageing under widely different climates. The tests included five types of clear transparent sheet plastics, six types of laminated materials and five types of moulded terminal bars. ("A.S.T.M. Bulletin," 1951/Apr./31.)

Classification and standardization of plastics.—General article surveying the present state of standardization of plastics in Germany. Recently the quality mark of plastics for electrical use has been re-introduced. ("Industrie Anzeiger," 1951/Mar. 9/43.)

Compressibility of high polymers.—C. E. Weir investigated natural and synthetic high polymers at pressures between 1,000 and 10,000 kg./ sq. cm. All compression curves determined were smooth except for polytetrafluorethylene with a transition at 5,500 kg./sq. cm. Data compare favourable with previously obtained results. ("Journ. Research Nat. Bur. Standards," 1951/Research Paper 2192/p. 207.)

Plastic pipe accessories.—The production by Carlon Products Corp. of a new line of injection-moulded plastic reducing bushings and end plugs for use with plastic pipes is announced. ("Production Engineering and Management," 1951/Apr./131.)

Bioplastic mounts without polishing.—R. Stohler gives recommendations for producing bioplastics in a mould composed of L-shapes avoiding sawing, sanding and polishing. (Ward's Natural Science Bulletin, 1951/Mar./58.)

Literature references.—A survey of plastics literature, 1949/1950, subdivided into: new materials; chemical, thermal, and permanence properties; mechanical properties; textile fibres and finishes; paper laminates and reinforced plastics; protective coats, coating and calendering equipment; plastic moulds and moulding, vinyl films and sheet; injection mouldings; extrusion and uses has been given by H. M. Richardson; 139 refs. are quoted. ("Mechanical Engineering," 1951/Mar./211.)

Physical behaviour of plastics.—F. H. Mueller considers a main characteristic of plastics, i.e., that their properties can be controlled. This differentiates them from other materials and can be explained by the structure and arrangement of molecules. In general they form a certain class of materials between "steel and liquids." ("Kunststoffe," 1951/Feb./41.)

Progress in the microscopic investigation of plastics is reported by R. Vieweg and J. Moll, in particular microscopic investigation of plastic foils has been made possible; surface texture could be investigated by the phase contrast method and inclusion of fillers and dyes have been studied. ("Kunststoffe," 1950/Oct./317.)

Plastics for product identification.—E. Drewitz describes a number of successful designs of plastics having unusual visual and service features. ("Product Engineering," 1951/Mar./132.)

Effect of straining rate on polystyrene.—C. C. Hsiao and I. A. Sauer devised a simple, inexpensive apparatus for maintaining a constant rate of strain throughout the test on tensile and compressive samples of polystyrene. ("A.S.T.M. Bulletin," 1951/Feb./29.)

Unbreakable non-glass mirror is said to have same reflectivity as glass mirror. It is produced by Flexmir Products Inc., Newark, N.Y., of "Plexiglass," a reflecting metal film and a third material which is not stated; it can be moulded for quantity production. Light weight about one-third that of glass is a main feature. ("Automotive Industries," 1951/Feb./88.)

Flame-resistant thermoplastic sheet will not support combustion and is recommended for aircraft and other uses. It is supplied in standard sizes, four standard colours and five grains. ("Automotive Industries," 1951/Feb. 15/134.)

Extrusion Mixing and Compounding

By Edwin G. Fisher*

THE colouring and compounding of thermoplastic resins is an important part of the plastics industry and it has long been realized that the screw extruder, if suitably developed, could form the basis of a very efficient plant for carrying out this process.

Extrusion mixing and compounding has many advantages over the internal pressure mixers and hot roll methods normally employed. It gives, for example, a continuous process as against a batch operation, and allows a reduced processing temperature to be used. Moreover, the mixing is always consistent and easily controllable. The exceptional mixing and mastication given by the multi-screw principle of extrusion has focused attention even more forcibly on the possibilities of this process, for which R. H. Windsor Ltd., have developed a complete continuous production unit.

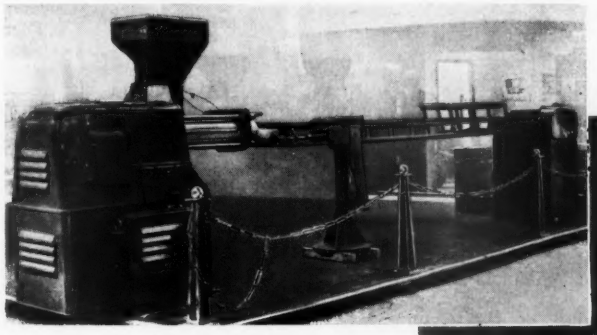
The complete equipment, which was in operation at the recent B.I.F., Castle Bromwich, was shown producing a dust-free, pastel blue moulding powder of uniform cubic chips from a non-consolidated mixture of polystyrene powder and pigment. The moulding powder was afterwards used on a Windsor S.H.4 injection moulding machine to produce combs for distribution.

The production unit consists of the latest R.C.100 twin-screw extruder, equipped with a polystyrene mixing die of special design. Associated with the extruder is a conveyor band take-off specially developed for the purpose, and, finally, a rotary chopper driven synchronously with the conveyor band.

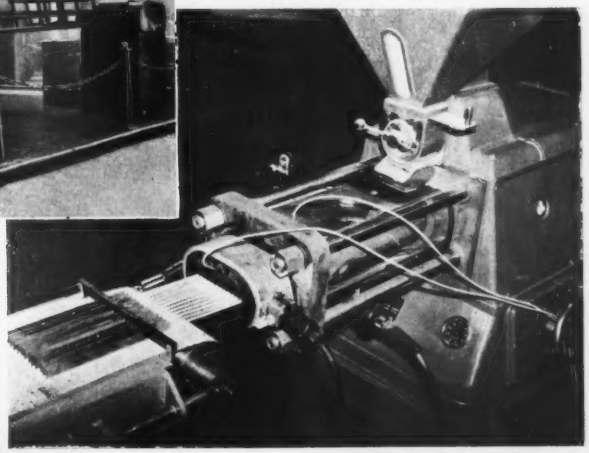
The ingredients of the compound are placed in the hopper of the extruder, and thence pass through the automatic metering device to the intermeshing twin screws of the extruder. The compounded mixture passes from the extrusion die in the form of square "spaghetti" and is drawn under tension by the conveyor band, via separators and gripping devices, to the rotary chopper, where it is severed into cubes of controllable size. Three adjustments are available for chip size control, i.e., the mechanical metering device on the automatic hopper, the variable speed control to the extruder drive motor and the variable speed drive to the conveyor band and chopper. Thus it is possible to produce moulding powders of any required chip size and when once set the unit will work automatically with attention only to recharging the hopper.

The maximum output of the equipment as shown is approximately 100 lb. per hour. Although seen working on virgin polystyrene, it will produce compounds from cellulose acetate or polyethylene with equal ease. The unit is very useful for recompounding scrap materials, and by changing the die it can be also used for the production of p.v.c. extrusion compounds.

*Chief of Extrusion Development, R. H. Windsor Ltd.



(Above) General view of R.C.100 extruder as set up by R. H. Windsor Ltd. at the Birmingham B.I.F. for mixing, extruding and chopping polystyrene for moulding powder.



(Left) Close-up view of R.C.100 extruder, showing special mixing die for polystyrene, and the first separator.

(Left) Polystyrene take-off, showing gripping rollers.

(Right) Rotary chopper with guard removed, showing the polystyrene rods being severed.

The British Plastics Exhibition

THE British Plastics Exhibition, which is being held at the National Hall, Olympia, London, June 6 to 16 inclusive, is really the second attempt of post-war years to hold an exhibition devoted wholly to the plastics industry of this country. It was at the Dorland Hall, in London, that a plastics exhibition on a much smaller scale was held in 1946 (see "Plastics," November, 1946, page 583). The present occasion, organized by our contemporary, "British Plastics," and supported by about 100 exhibitors, promises to give a much broader understanding of the wide range of fundamental applications of which modern plastics are capable. The exhibits include a comprehensive range of moulding media, laminates and other semi-finished material in the form of sheet, rod and tube, as also technical and industrial components, consumer goods and other finished manufactures of the plastics industry in its many and diverse ramifications. A selection of plastics machinery and equipment is also being shown, with preforming, compression and injection moulding, and extrusion processes in actual operation.

Simultaneously with the exhibition, there is also being held a Convention, at which some 36 papers follow an inaugural lecture. Many of these papers are of outstanding interest to the plastics industry itself, or to users of the products of that industry, as will be apparent from our reference to some of them on pages 178-181 in this issue.

A special feature of the exhibition, entitled "Plastics, Design and Use," is provided jointly by the Council of Industrial Design, the British Plastics Federation, and the Exhibition organizers. This feature attempts to show the man in the street what plastics are, how they are made, their special and distinctive properties, and the part they play in the everyday life of the modern community. Emphasis throughout is on good design, the exhibits as far as possible being drawn from the 1951 Stock List, and stress is laid on the importance of selecting the right plastics material for the job in hand, and the need for choosing the most suitable fabricating method.

At Stand G5 in the Gallery, Temple Press Ltd., proprietors and publishers of "Plastics," have their "Standicator" (a press-button device) which enables visitors to locate the position of any exhibitor on the ground floor or in the gallery. Here also are some notable products of the plastics industry.

Raw Materials and Products of the Industry

Airothene, Ltd. (Stand G46)
As manufacturers of fabricated and moulded components in polythene, this company exhibits beakers, funnels and large industrial components weighing 6 to 9 lb.

Ashdowns, Ltd. (Stand A18)
Mouldings in thermosetting and thermoplastic materials, extrusions in p.v.c., "Ashlam" S.R.B. paper mouldings for refrigerators; "Ashlam" S.R.B. boards for electrical insulation and mechanical applications; silicone-bonded glass-fabric-laminated board for high-temperature electrical insulation; fabrications in "Perspex" and other thermoplastic materials; and low-pressure glass-fabric-laminated sheets and mouldings.

Bakelite, Ltd. (Stands A12 and G1/3)
At this stand can be seen a wide range of plastics materials for essential applications in industry. Particular emphasis is laid on their use in aircraft engineering, radar and telecommunications, and electrical and mechanical engineering. Of particular interest are the special materials developed to perform some task which could not be performed in precisely the same way by any other material. Typical of such applications are the miniature valve bases on view. Moulded from a specially developed grade of "Bakelite" moulding material with low electrical loss, good moisture resistance, quick recovery from damp conditions and easy moulding properties, these valve holders comply with R.C.S.251 and can be used on frequencies up to 200 mc/s.

Barclay-Stuart (Plastics), Ltd. (Stand G55)
Industrial and domestic mouldings to be seen at this stand include radio knobs, radio coilformers, key tips, motor accessories, brush handles and household articles.

Barrett and Elers, Ltd. (Stand G19)
This company specialize in trade mouldings, particularly in relation to the electrical industry, and are showing meter cases, terminal blocks, bobbins, bushes, push-buttons, etc. For the hardware trade they supply handles and knobs for tea-pots, coffee percolaters and similar domestic ware.

British Celanese, Ltd. (Stand A23)
This exhibit demonstrates the versatility of "Celanese" plastics by coupling displays of plastic raw materials with examples of end-uses currently being fabricated in a wide range of trades and industries. This range of plastics comprises "Celastoid" sheeting (including optical quality) and extrusions (tubing, rods and sections), and "Clarifoil" transparent film, and "Cinemoid" special non-flam. sheeting.

The lamination of rayon filament yarn to "Clarifoil" in continuous strip form for decorative packaging ribbons is a new development. This product, which is available in various widths and colours, is called "Silsheen"; it can also be intaglio printed with special inks in one- or two-colour designs, giving an embossed finish. Because there are no cross-threads to cut the sheet, an unusually high lustre is obtained on both sides of the ribbon, and therefore there is no "wrong side." "Silsheen" is manufactured by Porth Textiles, Ltd.

British Geon, Ltd. (Stand A.22)
The story of Geon polyvinyl materials is told under the three headings. The first section deals with the development, from basic raw materials, of the various Geon resins, latices and compounds. The second section consists of flow sheet, which shows what the vinyl plastics manufacturing industry does with Geon.

How the characteristic properties of products made with Geon are put to good use by consumer industries is illustrated in the third section. The eight "industries" chosen include those covered by the Convention associated with the exhibition: chemical, transport, building and architecture, domestic, textile, surgery and medicine, packaging and electrical.

British Industrial Plastics, Ltd. (Stand A28)
This stand displays all the manufacturing activities and service facilities of the B.I.P. Group:—

Beetle Products Co., Ltd., show selections of finished products incorporating mouldings from "Beetle" urea and melamine and "Scarab" moulding powders; samples of fabrics treated with textile resins; a range of papers treated with paper resins to upgrade their wet-strength; and models of products finished with stoving enamels formulated with "Beetle" coating resins.

Beetle Bond, Ltd., have a display of adhesives and foundry core-binding resins.

Streetly Manufacturing Co., Ltd., show a selection of mouldings in urea, melamine, phenolics and thermoplastics.

Reference to B.I.P. Tools, Ltd., and B.I.P. Engineering, Ltd., will be found on page 176.

British Moulded Plastics, Ltd., and Moulded Products, Ltd. (Stand A15)
This combined display shows examples of all the types of plastic mouldings produced in the London and Birmingham factories of these companies. Prominence is given to work in current production, but a few pieces will be shown which were produced more than 25 years ago. The exhibits are grouped under the industries which they serve, including: Electrical, general engineering, automobile, radio and television, domestic equipment and refrigeration. This arrangement shows clearly that many different plastic materials, when used with knowledge of their properties, can serve the varying needs of an industry. It also shows that different plastic materials can be used together on one product, and that moulded plastics can be combined successfully with older materials.

It is interesting to note that although "thermoplastic" mouldings are now produced of a size that was scarcely dreamed of ten years ago, the older materials not only hold their own but continue to find new applications. This is especially true of "Telenduron" bitumen asbestos compound, one of the oldest materials used in plastic moulding, but which is now used to a greater extent than ever before.

From the point of view of technical achievement there is a great deal to see, but a recent production of particular interest is the Sobell console television cabinet, moulded from phenolic material, which

Summary of Exhibits of Raw Materials for Plastics Moulding

Exhibitor	Stand No.	Casein	Phenolics	Urea/melamine	Cellulose acetate	Vinyl polymers	Polystyrene	Polythene	Acrylics	Casting resins
BX Plastics Ltd.	A11	×	—	—	×	×	—	—	—	—
Bakelite Ltd.	A12	—	×	×	—	×	—	—	—	—
Birkbys Ltd.	A16	—	×	—	—	—	—	—	—	×
British Celanese Ltd.	A23	—	—	—	×	—	—	—	—	—
British Geon Ltd.	A22	—	—	—	—	×	—	—	—	—
British Industrial Plastics Ltd.	A28	—	—	×	—	—	—	—	—	—
British Resin Products Ltd.	A22	—	×	×	×	—	×	—	—	—
East Anglia Plastics Ltd.	B7b	—	—	—	×	—	—	—	—	—
Erinoid Ltd.	A5	×	—	—	×	×	×	—	—	—
James Ferguson and Son Ltd.	A21	—	×	—	—	—	—	—	—	—
Hornflowa Ltd.	G20	×	—	×	—	—	—	—	—	—
I.C.I. (Plastics Division)	A27	—	×	×	—	×	—	×	×	×
R. C. Mills Ltd.	A10	—	—	—	×	—	—	—	—	—
Monsanto Chemicals Ltd.	A3	—	—	—	—	—	×	—	—	—
United Ebonite and Lorival Ltd.	A14	—	—	—	—	—	—	—	—	×
Telegraph Construction and Maintenance Co. Ltd.	G54	—	—	—	—	—	—	×	—	—

Plasticizers:
Geigy Co. Ltd. B2a
Lankro Chemicals Ltd. B2b
Monsanto Chemicals Ltd. A3

Adhesives and cements:
Bakelite Ltd. A12
Beetle Bond Ltd. A28
Birkbys Ltd. A16
British Industrial Plastics Ltd. A28
British Resin Products Ltd. A22

stands three feet high, weighs thirty-two pounds and is one of the biggest compression mouldings yet produced. The injection moulded body and bell, in "Diakon," of the full size tenor saxophone; a large motor-car panel in clear polystyrene, metallized and spray painted on the back; and the fireman's helmet and miner's helmet, moulded from tailored fabric material, are other examples of new enterprise.

British Resin Products, Ltd. (Stand A22)

The activities of this company are divided into groups covering "Rockite," "Cellomold" and "Distrene" moulding materials, "Cellobond" adhesives, "Epok" industrial resins, "Epok" surface coating resins and "Epok" cashew-nut shell liquid resins and polymers. These materials and their many applications are featured on display panels.

British Xylonite Co., Ltd. (Stand A11)

The British Xylonite Group presents on one stand a composite display representing the activities of five of the major companies in the Group: B.X. Plastics, Ltd., Halex, Ltd. (selling company for The British Xylonite Co., Ltd., Halex Division), Cascelloid, Ltd. (selling company for the Cascelloid Division), Scintillex, Ltd. (selling company for the Scintillex Division), and Expanded Rubber Co., Ltd.

This stand affords a striking illustration of the growth and development of the plastics industry, in which The British Xylonite Co., Ltd., the parent company, has played a leading part since 1877, when it was founded to manufacture celluloid ("Xylonite") and to fabricate articles from this material.

B.X. Plastics, Ltd., show extruded polythene layflat tube and extruded monofilaments, as well as their well-known thermoplastic materials, including "Xylonite," "Bexoid," p.v.c. and "Lactoid."

Halex, Ltd., display examples of the various techniques employed in manufacturing toilet brushes, i.e., celluloid drawn with bristle, cellulose acetate drawn with nylon; also industrial mouldings, including lavatory seats.

Cascelloid, Ltd., have a selection of injection moulded articles of all descriptions, blown polythene bottles, transparent packaging, lay-flat polythene bags, and various injection moulded and fabricated containers.

Expanded Rubber Co., Ltd., are represented by examples of "Rubazote" (soft expanded rubber) and "Onazote" (hard expanded ebonite with remarkable properties of thermal insulation and buoyancy) and "Fuff" (foamed urea-formaldehyde).

Scintillex, Ltd., exhibit plastics jewellery and examples of their latest development—articles metallized by their own process.

E. K. Cole, Ltd., Plastics Division (Stand A20)

Established in 1932 for moulding the cabinets required by the radio side of the business, the Plastics Division of this company has since extended its scope very considerably and now moulds for many trades in addition to meeting their own and other companies' requirements for radio and television receiver and component manufacture.

The comprehensive display of large and small mouldings gives an indication of the scope of the Ekco plant, the capacity of which is from less than an ounce to 16 lb. compression moulded, and from ½ oz. to 48 oz. injection moulded.

P. B. Cow and Co., Ltd. (Stand G21)

"Li-Lofilm" and "Li-Lolastic" printed sheetings, "Li-Lomac" rainwear and sponge bags, and the "Li-Lo" play ball are included, with a small range of plastic industrial covers and aprons.

Their subsidiary company, **London Moulders (Plastics), Ltd.,** show picnic and nursery tableware in various pastel colours, boxed nursery sets and tea sets, and a selection of industrial mouldings.

Creators, Ltd. (Stand G48)

This company is exhibiting various applications of extruded, dip moulded and injection moulded articles. They include "Armourvin" connectors in various types and patterns, examples of these productions in use being a Minimotor cycle attachment and a Petter Diesel engine; a dentist's chair pedestal; concertina-type gaiters as used on agricultural implements, universal ball joints and shock-absorber units; accessories applicable to the radio trade, such as steel-reinforced strap handles for portable radio sets and bushes for facia panels; junction sleeves for electrical wiring systems, together with harness wiring looms as used in aircraft; p.v.c. gaskets, grommets, etc., and plastics-insulated tools such as spanners and pliers.

Thomas De La Rue and Co., Ltd., Plastics Division (Stands A4 and G58b)

The general theme of these stands is to demonstrate the important part the company's products play in everyday life. The advantages of "Formica" laminated plastics in the home are stressed; particularly the withstanding of moisture and steam in kitchen and bathroom, and heat-resisting and abrasion qualities. "Delaron" is emphasized in its use for radio and television sets, the telephone and carpet sweepers. Extrusions are shown in the shape of fountain-pens and screwdriver handles. Outside the home, the same products perform an equally important function in industrial life—"Formica" in factory canteens and on work benches is unaffected by water, oil, petrol, acids, inks and alcohol; "Traffolyte" in the form of labels, diagrams and dials; "Delaron" in power-station equipment, signalling apparatus, scientific instruments.

East Anglia Plastics, Ltd. (Stand B7b)

The manufacture of high-grade cellulose acetate moulding powder, and the dyeing and extruding of polystyrene in special shades and colours, are featured. Photographs and samples show the relationship between modern laboratory and factory control and the perfect-finished product.

Embossing and Spraying Co., Ltd. (Stand G26)

Plastics in sheets and rolls for the fancy goods, handbag, leather goods and allied trades seen at this stand are mostly imitation reptile skins, i.e., python, cobra, lizard, etc.

Erinoid, Ltd. (Stand A5)

Casein (sheets, rods, blanks, tubes), cellulose acetate (moulding powders, sheets, extrusions), p.v.c. (extrusions, sheets) and polystyrene (moulding powders, sheets, extrusions) are displayed. Special prominence being given to the range of optical sheets.

An associated company, **Utilex, Ltd.,** show cellulose acetate film and various containers

The display of polystyrene moulding powders, products of **Styrene Products, Ltd.,** includes photographic records of this company's new plant.

James Ferguson and Sons, Ltd. (Stand A21)

A range of "Nestorite" moulding materials, also a number of mouldings produced by various customers of this company.

Ferodo, Ltd. (Stand G28)

Here is a representative range of products made from "Ferobestos" technical plastics. This versatile material is available in four qualities, each possessing special characteristics. The articles displayed include chemical plant, heavy-duty bearings and bushes, wear-resistant parts, compressor blades, piston rings, thrust washers, silent gear wheels, and other examples of general engineering interest.

Geigy Co., Ltd. (Stand B2a)

The main theme centres on the company's new products, sebacic acid and derivatives. Such derivatives include the placticizers, dibutyl sebacate (Reomol DBS), dioctyl sebacate (Reomol DOS) and sebacic acid polyesters (Reomol PPS series). The stand gives prominence to the applications of these chemicals and throws into relief the charac-

Summary of Exhibits of Plastics in Sheet, Rod and Tube Form

Exhibitor	Stand No.	Sheet						Cellulose acetate film	Laminates		Extrusions	Expanded plastics	Resin-bonded wood
		Acrylic	Cellulose acetate	Casein	P.v.c. (unsupported)	P.v.c. (coated fabric)	Rigid p.v.c.		Electrical and general purpose	Decorative			
Ashdowns Ltd.	A18	—	—	—	—	—	—	—	×	—	×	—	—
BX Plastics Ltd.	A11	—	×	×	×	—	×	×	×	—	×	—	—
Bakelite Ltd.	A12	—	—	—	—	—	×	—	×	—	—	—	—
British Celanese Ltd.	A23	—	×	—	—	—	—	×	—	—	×	—	—
Creators Ltd.	G48	—	—	—	—	—	—	—	—	—	×	—	—
P. B. Cow and Co. Ltd.	G21	—	—	—	×	—	—	—	—	—	—	—	—
Thomas De La Rue and Co. Ltd. (Plastics Division)	A4	—	—	—	—	—	—	—	×	×	×	—	—
British Resin Products Ltd.	A22	—	—	—	—	—	—	—	—	—	×	—	—
Erinoid Ltd.	A5	—	×	×	×	—	×	—	—	—	×	—	—
Expanded Rubber Co. Ltd.	A11	—	—	—	—	—	—	—	—	—	—	×	—
Embossing and Spraying Co. Ltd.	G26	—	—	—	×	×	—	—	—	—	—	—	—
Ferodo Ltd.	G28	—	—	—	—	—	—	—	×	—	—	—	—
Hornflowa Ltd.	G20	—	—	×	—	—	—	—	—	—	×	—	—
I.C.I. (Plastics Division)	A27	×	—	—	×	×	×	—	—	—	—	—	—
Ioco Ltd.	G4	—	—	—	—	×	—	—	×	×	—	—	—
Insulation Equipments Ltd	B9	—	—	—	—	—	—	—	×	—	—	—	—
Moulded Components (Jablo) Ltd.	G9	—	—	—	—	—	—	—	×	—	—	×	×
Phœnix Rubber Co. Ltd.	G24a	—	—	—	×	—	—	—	—	—	×	—	—
Plastahide (Coverings) Ltd.	G27	—	—	—	×	×	—	—	—	—	—	—	—
Saro Laminated Wood Products Ltd.	G25	—	—	—	—	—	—	—	—	—	—	—	×
Small and Parkes Ltd.	G51	—	—	—	—	—	—	—	×	—	—	—	—
Storey Brothers and Co. Ltd.	A19	—	—	—	×	×	—	—	—	—	—	—	—
Suflex Ltd.	G32	—	—	—	—	—	—	—	—	—	×	—	—
Tufnol Ltd.	A13	—	—	—	—	—	—	—	×	—	—	—	—
Telegraph Construction and Maintenance Co. Ltd.	G54	—	—	—	—	—	—	—	—	—	×	—	—
Utilex Ltd.	A5	—	×	—	—	—	—	×	—	—	—	—	—
United Ebonite and Lorival Ltd.	A14	—	—	—	×	—	—	—	—	—	—	—	—
Vere Engineering Co. Ltd.	B11	—	—	—	—	—	—	—	—	—	—	—	×
Warerite Ltd.	A12	—	—	—	—	—	—	—	—	×	—	—	—
Wiggins, Teape and Alex. Pirie (Sales) Ltd.	G6	Paper for laminates.						—	—		—	—	—

teristics of the end products. The uses of other plasticizers, such as tricresyl phosphate, triphenyl phosphate and various phthalate plasticizers are indicated in the overall make up of the stand, i.e., in flooring and upholstery.

Hornflowa, Ltd. (Stand G20)

This concern exhibits their very wide range of buttons. A new button, manufactured by the company's Solway process, is an imitation of natural horn and will be known as the Brazil button.

Further, they emphasize their tool-room facilities for mould making, and injection and compression moulded articles. The "Soleway" p.v.c. flooring tile, in a range of attractive and useful plain and marbled colours, is a new product.

I.C.I., Ltd., Plastics Division (Stands A27 and G58a)

The Plastics Division of I.C.I. tells the story of its Technical Service and Development Department. Particular emphasis is given to the work being carried out by the Lighting Research Section of this Department, and visitors can see various experiments demonstrating the optical properties of "Perspex." In addition, there are large colour transparencies depicting some of the main activities of Technical Service. Film strips showing moulding and fabricating techniques are being continuously projected.

Insulation Equipments, Ltd. (Stand B9)

A large range of component parts manufactured from laminated industrial type material covers the aircraft, electrical and engineering industries. In addition, this company illustrates its developments in the use of "Warerite" laminates, covering cocktail bars, interior fittings, panelling and tables.

Insulators, Ltd. (Stand A17)

Insulators, Ltd., manufacturers of all types of plastic mouldings using thermo-setting and thermo-plastic materials exhibit a comprehensive range of trade mouldings produced to customers' drawings and specifications, covering various industries. New items of particular interest include a "Loudspeakerphone," comprising master and extension units, both cabinets being made in phenolic materials, grilles in p.f. urea, push buttons in polymethyl methacrylate, control knobs in cellulose acetate; an example of four different materials combined in one complete component. A domestic iron using paraffin has handle in phenolic material and control knob in w.f. urea.

Ioco, Ltd. (Stand G4)

"Formapex" laminated sheets and tubes incorporating phenol-formaldehyde resin of this company's own make, now available in a wide range of paper and fabric base grades, will be seen at this stand. The accurate control of all the constituents make it possible to produce various grades of sheet and tube, each having certain characteristics which make them especially suitable for many different purposes. In varying degrees, all these grades have electrical insulating properties; mechanical strength combined with lightness, resistance to moisture, resistance to heat, inertness to chemicals and machinability. This unusual combination of properties makes "Formapex" a most effective electrical insulating material.

Also exhibited are "Artoco" laminated boards and veneers for decorative purposes used in building and ship fitting; rail track insulation; "Ocoseal," which is a combination of "Formapex" laminated sheet and rubber, used in its simplest form for sealing electrical condensers, and also made in multiple form for sound and vibration absorbing mounting blocks; magnetic slot wedge material, which is a laminate incorporating woven wire fabric for making magnetizable wedges for increasing efficiency of 3-phase induction motors; and "Zapide" and "Zapon" leathercloths.

Kent Mouldings (Stand B10)

Toys, knitting machine bobbins, textile bobbins and pirns, radio cabinets, knobs and parts, hearing aid cases and parts, advertising signs and novelties, domestic ware.

J. F. Kenure, Ltd. (Stand A1)

The very wide range of mouldings at this stand includes acid-resisting equipment, beakers (polystyrene and polythene), bicycle handle grips, closures for bottles and jars, coil formers, moulded containers, display fittings, educational toys, electrode holders, moulded funnels, gaskets (p.v.c.), insulating grommets and general polythene goods.

Lacrinoid Products, Ltd. (Stand A29)

This company shows their complete range of housing fitments, furniture fittings, buttons (including Supertone ladies' buttons, machined from thermo-setting plastics, which is a new development by Lacrinoid), handles for all purposes, and "Lacrinite" in its various applications.

Lankro Chemicals, Ltd. (Stand B2b)

This company manufactures dioctyl phthalate, dibutyl phthalate and butyl acetyl ricinoleate. They also exhibit stabilizers and colours for polyvinyl chloride.

Litholite Insulators and St. Albans Mouldings, Ltd. (Stand G23)

Mouldings produced by compression and transfer methods from synthetic resin powders of general purpose, shock resisting, low loss, and other grades. Included are moulded components for power stations and electricity distribution, couplers for charging battery driven vehicles, industrial and domestic electric equipment, switch parts (including miniatures), and components for motors and lighting for electric sewing machines.

Monsanto Chemicals, Ltd. (Stand A3)

"Lustrex" polystyrene injection moulding crystals is the main exhibit by this company. "Lustrex" is manufactured at Monsanto's new factory at Newport, Monmouthshire, and represents the first large-scale production in Great Britain of this versatile plastic material, which is available in its natural glass-clear colourless form and a wide selection of colours.

Another exhibit of general interest is a range of chlorinated diphenyls and poly-

phenyls known as the "Aroclors." Not previously manufactured in this country they range from mobile liquids to clear resins. Their primary interest to manufacturers of plastics goods and materials is as plasticizer extenders. In polyvinyl chloride compositions as much as 40-50 per cent. of dioctyl phthalate may be replaced with an Aroclor, while fully maintaining the physical properties and improving flame resistance.

Moulded Components (Jablo), Ltd. (Stand G9)

This company's products include "Jabroc," which is a laminated highly densified structure, and "Aero Jablex," which is a lightweight expanded plastic with a great number of industrial applications.

Phœnix Rubber Co., Ltd. (Stand G24a)

"Phenco" plastic flooring in roll form and tiles, bench and bar coverings, plastic sheeting in all thicknesses, plastic hose, and reclamation scrap rubber and plastic anti-corrosion compounds.

Plastahide (Coverings), Ltd. (Stand G27)

The "Plastahide" shown by this company is a flexible p.v.c. sheeting in a variety of colourful shades of red, blue, green, yellow, orange and brown, printed with a leather pattern one side and with a plain surface on the reverse. It is employed extensively as an upholstery covering for all types of seating, including theatre and boat upholstery.

Plastic Engineers, Ltd. (Stand G35)

The Nylon section at this stand focuses attention on the great merit of nylon as an engineering material. This synthetic material has good heat resistance properties, low co-efficient of friction, high tensile strength, dimensional stability and high resistance to many chemicals. Its qualities make it valuable for light bearings, bushes, oil seals, silent gears and valve components.

A range of products for the cosmetic and pharmaceutical trades are also displayed; the material used for these containers is generally polystyrene.

Plasticads, Ltd. (Stand G7)

Exhibits include engraved and silk screen show cards, fabrications in "Perspex," calendars, desk pads, cut-out "Perspex" letters, illuminated signs, etc. A subsidiary company, Tyraks, are showing a novel tie holder, part of which is plastics.

Punfield and Barstow (Mouldings), Ltd. (Stand B8)

Special purpose mouldings, e.g., nylon hypodermic needle fittings, bearing bushes, gears, insulating sleeves and traverse guides for the textile industry; moulding for the electrical industry, e.g., accumulator cases, bobbins, coil formers, coil mounting blocks, and switch dollies; also mouldings for the radio industry and the motorcar and cycle industry.

Ranton and Co., Ltd. (Stand G31)

Amongst the general mouldings produced by this company are vacuum flasks, jugs and cups for the leading manufacturers, bottle and jar closures, cosmetic containers and fancy goods for the chain stores.

The company, which have been manufacturers of "Rock" electrical accessories since 1929, has recently acquired the manufacturing and selling rights of the Gregg patent ceiling rose, the features of which are that it has earthed connection, fittings can be removed for cleaning in a moment without switching off or removing a fuse.

Rediweld, Ltd. (Stand A6)

This display of polythene and rigid p.v.c. equipment for handling corrosive liquids includes safety jugs, a series of pipelines together with valves and a motorized pump, p.v.c. ventilators, a fume duct, a wash tower, protective clothing in p.v.c. cloth, p.v.c. filter bags and an acid metering wheel which is in operation. The company's heat sealer for polythene and pliofilm, and welding equipment suitable for the gas welding of thermoplastic materials are also shown.

Rosedale Associated Manufacturers, Ltd. (Stand A10)

A number of new productions, ranging from toys to toilet articles, are shown for the first time. The annual output of toys by the Rosedale Group is said to be 15 million.

Runcolite, Ltd. (Stand B11)

Festival of Britain souvenirs are displayed prominently by this company. The décor of these articles, by well-known artists, is applied by a special underglaze process, and being moulded in, it is resistant to abrasion and unaffected by hot water, alcohols and acids.

Saro Laminated Wood Products, Ltd. (Stand G25)

A full range of liquid plastic finishes for wood. These materials are used by London Transport for finishing the interior panelling of their new light alloy Metropolitan Line coaches. Similar panelling is also being used for the interior lining of the De Havilland "Comet."

Simmonds Aerocessories, Ltd. (Stand G38)

A wide range of specimen assemblies shows the use of "Spire" speed nuts, fixes and clips, in connection with plastic materials. These universal fasteners are made for threaded and unthreaded members and are resilient, self-locking and vibration-proof. They are particularly suited to plastic applications and provide fast, simplified assembly with considerable reductions in labour and material costs.

Small and Parkes, Ltd. (Stand G51)

Laminates for electrical and general purposes, and bearings for general engineering.

Storey Brothers and Co., Ltd. (Stand A19)

P.v.c. sheet in the form of table covers and texturized "Storeen" for curtains and many making-up purposes. "Storeen" has been on the market for some time, but the texturizing of this material is a new innovation. It has the advantage of greatly improving the draping quality, and also of taking away any tendency to tack.

Suflex, Ltd. (Stand G32)

Among the articles shown are electrical and radio sleeving made in both p.v.c. and polythene, double piping in p.v.c. for upholstery, wing piping in p.v.c. for motor body work and upholstery, corrugated hose piping in p.v.c., soft p.v.c. sleeving in non-electrical grades for toy makers, p.v.c. draught extruder strip and extruded p.v.c. escutcheon edging for cabinet surrounds, radio scales and loud-speaker escutcheon.

Telegraph Construction and Maintenance Co., Ltd. (Stand G54)

The main feature of this exhibit is a demonstration of a dipping technique employing "Telcothene" powder, which is polythene processed by "Telcon" to provide specific characteristics. In the process demonstrated, a component is heated to a temperature of 160 degrees C. to 180 degrees C. in an oven for a short period, It is then removed and rapidly drawn through cold "Telcothene" powder until every part is covered. This operation must be completed with the minimum of delay, because loss of heat on any part of the component results in an uneven coat. At this stage the "Telcothene" powder in direct contact with the component becomes fused, while an exterior layer is only partially affected. The component is now replaced in the oven for a further cycle at the same temperature, and on removal an even coating of "Telcothene" is obtained. The coatings may be satisfactorily spark tested, thus ensuring that there is no porosity.

Examples of Telcon products since 1845 in both moulded and extruded gutta percha and "Telcothene" are also displayed, including moulded gutta percha articles which the company exhibited at the 1851 exhibition.

Thermo-Plastics, Ltd. (Stand A2)

This well-known concern are featuring a range of their standard lines for domestic use which include sanitary fittings, bathroom fittings, cups and saucers, etc.; also equipment produced from acrylic material for canteen and catering establishments, i.e., revolving sandwich containers, pastry dispensers and trays.

Another section of the stand is devoted to components produced for the photographic industry, including an etching bath in rigid p.v.c., and developing tanks and dishes in cellulose acetate and Perspex.

Examples from the range of escutcheons manufactured for the radio industry are also exhibited, together with various industrial components produced from post-formed "Bakelite," "Perspex," cellulose acetate (both plain and wire reinforced), rigid p.v.c. and polythene. Examples are shown of injection and compression moulding in thermoplastic and thermo-setting materials. A special feature is made of advertising displays and show stands, including several interesting examples of compression mouldings in urea.

Another section of this stand is devoted to components and sheets produced from laminated fibre glass, both plain and sandwich construction. Examples of honeycomb section are available for inspection, together with double curvature mouldings.

D. G. Todd and Co., Ltd. (Stand G58c)

A selection of injection mouldings made in the company's factory and a complete range of finished products, i.e., mouth-organs and dolls. A 3-oz. injection moulding machine is engaged in moulding the "Midgemonica" mouth-organ reeds, and two girls are assembling the mouth-organs as the reeds come off from the machine. The company generally demonstrates the accuracy to which we can mould on a standard injection moulding machine.

Tufnol, Ltd. (Stand A13)

Specimens of "Tufnol" in its basic forms of sheet, tube and rod, and "Tufnol" bearings, gear wheels, pulleys and other machined and moulded components likely to be of interest to engineers in every industry.

United Ebonite and Lorival, Ltd. (Stand A14)

The Lorival display tells the story of the company's activities in the large-scale production of plastic or ebonite components and finished articles for industry and the home.

Vere Engineering Co., Ltd. (Stand B11)

This company's stand stresses the fact that despite the world shortage of timber, nearly 60 per cent. of every tree felled is allowed to go to waste, and the disposal of this waste has itself become a problem. Using wood waste, the "Celloboard" machine can produce a board by a continuous process in widths up to 4 ft. and of any desired length. The product has a wide range of applications, as is shown by the stand itself, which is built entirely of "Celloboard."

W.R.C., Ltd. (Stand G37)

Electrical wiring accessories, including lampholders, plugs, sockets, switches, etc., precision mouldings in thermosetting materials for the trade and aircraft industry; mould design and construction for the production of mouldings to customers' own requirements.

Warerite, Ltd. (Stands A12 and G24b)

"Warerite plastics in industry" is the theme at this stand. These decorative laminated sheets with their smooth, "non-snag" surface have been found excellent materials for inspection tables and work benches. By a suitable choice of colour and pattern, packing tables can be given a finish restful to the eyes, yet remain hard-wearing. Canteen table tops in laminated plastics are hygienic, colourful and labour saving.

Printed notices incorporated in "Warerite" decorative plastics acquire permanent protection from oily hands and all normal wear and tear. Wiring diagrams, safety notices, direction signs, routine instructions and maps, plans and diagrams of all kinds where permanence is desirable may with benefit to the user be incorporated in "Warerite" sheets.

Wiggins Teape and Alex Pirie (Sales), Ltd. (Stand G6)

This exhibit of industrial papers includes base papers for decorative laminates, laminated sheets and plastic coating; also filler papers, glass fibre paper for lamination, and a new non-woven fabric. Wiggins Teape products represent 25 years of achievement in this field, which has contributed much to the development of laminates in the plastics industry.

Wilmot Breeden, Ltd. (Stand G29)

This company's exhibits are restricted to their three-dimensional or stereoscopic plastics, to which reference was made in "Plastics," February, 1951, page 30.

Zell-Em, Ltd. (Stand G50)

Self-adhesive interchangeable letters and figures and self-adhesive plastic advertising novelties.

Almex, Ltd. (G56), dealers in scrap plastics; **Birkbys, Ltd.** (A16); **British American Research, Ltd.** (G34); **Easiwork, Ltd.** (G30); and **O. and M. Kleemann, Ltd.** (B1) are also exhibiting.

Machinery and Equipment for the Industry

B.I.P. Tools, Ltd., and B.I.P. Engineering, Ltd. (Stand A28)

Various mould parts, hobbings and induction heating coils are displayed by B.I.P. Tools, Ltd.

B.I.P. Engineering, Ltd., have in operation their "Bipel" moulding press (Type 40), with automatic control of the moulding cycle and self-contained drive unit.

Christy and Norris, Ltd. (Stand B3)

Sprue cutting machines are exhibited by these well-known makers of disintegrating and pulverizing machinery. Their junior rotary cutter, driven by a 1-h.p. motor, will take plastics sprues of $\frac{1}{2}$-in. diameter, pieces 3-in. long by $\frac{1}{4}$-in. thick, pieces 1-in. cube, or hollow mouldings 3-in. by 2-in. by 1-in. Using a screen plate with $\frac{3}{16}$-in. diameter holes, the output ranges from 30 to 60 lb. per hour. One of these cutters placed adjacent to each injection moulding machine will enable the operator to granulate the sprues immediately, thus avoiding the necessity of storage.

T. H. and J. Daniels, Ltd. (Stand A24a)

This exhibit consists of a Daniels preforming machine and a Daniels hydraulic press, which, in conjunction with a radio frequency heater, are producing a typical phenolic moulding.

The preforming machine is the largest yet produced by this company, and one which is thought will fill a long-felt need in the plastics industry. It is an hydraulically operated machine which exerts a maximum load of 125 tons on a 6-in.-diameter tablet. Although the machine is producing a circular tablet, it may be used to produce any shape which will fit into a 6-in.-diameter circle. It is arranged for fully automatic operation by means of a modified Daniels process timer, and the pumping unit makes it a self-contained unit. The control valves are of the piston type, and attached to these valves are the air cylinders, which are a part of the automatic control mechanism.

This preforming machine can handle fabric-filled materials if the filling is done manually, and in this case the operation of the machine is semi-automatic, the operator starting the machine at the beginning of each cycle. One advantage, when using materials of this type, is that pressure is applied from both the top and the bottom of the tablet.

The 150-ton downstroke press has a "Fescolised" main ram. This is an advantage when water is used as the hydraulic medium, although in the case of this particular machine, which is a self-contained unit, the fluid in use will, of course, be oil. However, the use of a "Fescolised" ram is still a great advantage, as it minimizes wearing of the packings. The press is fitted with 26-in. square electric platens and has a maximum daylight of 18 ins. It is a semi-automatic machine; being equipped with the Daniels process timer, the operator has only to load the material into the mould and close the press.

Davidsons Engineers (Manchester), Ltd. (Stand G53)

The company are exhibiting their "Plasticor" $\frac{1}{2}$-oz. hand injection moulding machines.

Dowding and Doll, Ltd. (Stand B2c)

The new Lester L-1/2-4 injection moulding machine, conservatively rated at 4-oz. capacity, is the principal exhibit at this stand. The company have the exclusive manufacturing and selling rights for the Lester injection machines for the U.K., Europe, and with certain exceptions the British Commonwealth.

This modern injection moulding machine incorporates many Lester features that are the result of years of experience. Die operating and locking is amazingly simple and efficient, with a specially designed double toggle mechanism. The vertical injection cylinder has two external heating zones, each with pyrometer control and one-piece spreader specially streamlined to minimize resistance to flow, trapping and burning of the material. This spreader is fitted with an internal heater having separate pyrometer control, thus ensuring the maximum plasticizing capacity. Injection speed and pressure are separately controllable. The vertical cylinder is completely and accurately filled at each shot in exact proportion to the previous shot, by the new, square compensating material feeder. The entire injection unit can be swung out and round for easy inspection and is equipped with automatic nozzle cut-off for nylon moulding.

Also shown are the "Westminster" 10-gram. ($\frac{1}{2}$-oz.) hand-operated injection machine, already well known in the plastics industry, and an hydraulically operated "Westminster" of $\frac{1}{2}$-oz. capacity.

W. Edwards and Co. (London), Ltd. (Stand A26a).

In many cases the substitution of plastic mouldings for metal articles, especially desirable for electrical components and decorative purposes, is less attractive than it might be because of the loss of valuable metallic properties, such as electrical conductivity or the sales value of a polished surface. This deficiency, however, can now be made good by the quick and simple deposition of metal films on plastic by vacuum coating technique.

Fescol, Ltd. (Stand A24c)

This exhibit emphasizes the value of the service made available to the plastics industry by the "Fescol" process of electrochemical deposition.

The "Fescolising" of hydraulic rams in nickel and/or chromium provides a non-corrodible surface, corrosion being one of the principal causes of wear in hydraulic rams.

By courtesy of T. H. and J. Daniels, Ltd., a working hydraulic press fitted with a "Fescolised" ram, is exhibited.

The deposition of chromium to prevent wear is illustrated by an enlarged photograph of an extrusion machine supplied with "Fescolised" tie bars, by courtesy of R. H. Windsor, Ltd.

Moulds which are "Fescolised" in chromium not only increase the life of the mould, but also improve the finish of the product as moulded.

Funditor, Ltd. (Stand A26b)

The machines seen at this stand provide a simple and convenient means for marking plastics. Also exhibited is the "Supersaw," which cuts rods, extruded sections and plastic sheets to accurate lengths, either singly or in bulk, by means of a carbide-tipped saw-blade mounted on a saw arbor revolving at high speed. Inserted in the saw arbor are three carbide-tipped trimmer knives, which ensure a smooth surface to the cut. This machine has various accessories for cutting mitres and bevels, and is therefore extremely useful in plastics fabrication.

Gauge and Tool Manufacturers' Association (Stand B4a).

About 30 members of the Association are showing plastics moulds and dies, in a composite exhibit.

General Electric Co., Ltd. (Stand B4a)

Part of this stand is devoted to equipment made by G.E.C.; the other part features the work of Witton Moulded Insulation Works as trade moulders.

The equipment shown includes a high-frequency unit 2 kW plastics preheater; infra red plastic preheating oven (where fast preheating rates are not of primary importance); infra-red heating units in the form of troughs, fitted either with lamps or sheathed wire units; infra-red oven for softening thermoplastic sheet, such as "Perspex"; and an infra-red heater, incorporating the "Sherwin" vibratory conveyor, for moulding powders.

Kestner Evaporator and Engineering Co., Ltd. (Stand B5)

The plant exhibited at this stand shows the company's products from the point of view of manufactured plastics, featuring "Keebush" material, polythene and p.v.c., and also equipment for the manufacture of plastics.

Among the former exhibits are some very large mouldings, for example, a barometric condenser 3-ft. diameter by 10-ft. high. together with a range of pipework, valves and fittings as used in the chemical and allied industries. A 24-in. axial flow fan, also a 6-in. high-pressure fan, both made of "Keebush," are in operation, together with two vertical glandless pumps circulating liquor from "Keebush" tanks through pipework; one of these pumps is made in "Keebush," the other in p.v.c., and the pipelines are combinations of "Keebush" and p.v.c.

The exhibits, covering plant for the manufacture of plastics, include resin kettles, stirrers, and carboy dischargers.

London and Scandinavian Metallurgical Co., Ltd. (Stand B6)

This exhibit comprises hard nickel electroformed moulds, in the manufacture of which this company specializes.

One half of the stand is devoted to a general display of injection moulds and articles moulded therefrom. A semi-automatic injection moulding machine (kindly lent by R. H. Windsor, Ltd.) is operating a special electroformed two-impression mould for components of a particularly intricate shape, the moulds for which could only with great difficulty have been produced by means other than electroforming.

The other half of the stand deals with the largest specialized application of hard nickel electroformed moulds, i.e., moulds for the production of acrylic teeth.

P.A.M., Ltd. (Stand G8)

The temperature control units manufactured by this company are demonstrated as applied to plastic machinery, including a Daniels moulding press, a Hupfield injection moulding machine, and an extruder.

Projectile and Engineering Co., Ltd. (Stand A7)

A complete range of the "Peco" injection moulding machines, 2 oz., 4 oz., 6 oz., 8 oz., and 16 oz. capacities, incorporating many distinctive features in design, are shown by this company.

The 2 oz. and 4 oz. capacities are self-contained machines. They are built on a prefabricated base unit, and incorporate direct hydraulic lock action. A high plasticizing capacity, together with a high rate of injection and extremely simple mould setting arrangements, make these machines highly suitable for either long-run production or short single-cavity trial runs.

The 6 oz. and 8 oz. capacities are also self-contained machines, and are built on a three-unit principle, giving great mould accessibility, and contain the one-piece steel frame construction which ensures increased rigidity, and reduced elongation and deflection, and avoids trouble due to flexing.

The 16 oz. machine is a recent addition. It incorporates many of the tried and proved features of other "Peco" models, embodying a low centre height (only 47 ins.) which permits easy operation of the machine and together with retractable tie-bar greatly assists in the setting-up of moulds.

Summary of Exhibits of Plastics Machinery and Equipment

Exhibitor	Stand No.	Compression and transfer moulding	Injection moulding	Preforming machines	Automatic control for moulding cycle	Moulds and dies	Extrusion machinery	Calenders	Mixing machinery	High-frequency preheating and welding
B.I.P. Engineering Ltd.	A28	X	—	—	X	—	—	—	—	—
B.I.P. Tools Ltd.	A28	—	—	—	—	X	—	—	—	—
T. H. and J. Daniels Ltd.	A24a	X	—	X	X	—	—	—	—	—
Davidsons Engineers (M/c) Ltd.	G53	—	X	—	—	—	—	—	—	—
Dowding and Doll Ltd.	B2c	—	X	—	—	—	—	—	—	—
Gauge and Tool Makers' Association	B4a	—	—	—	—	X	—	—	—	—
General Electric Co. Ltd.	B4b	—	—	—	—	—	—	—	—	X
Granbull Tool Co. Ltd.	G39	—	—	—	—	X	—	—	—	—
London and Scandinavian Metallurgical Co. Ltd.	B6	—	—	—	—	X	—	—	—	—
Projectile and Engineering Co. Ltd.	A7	—	X	—	—	X	—	—	—	—
Radio Heaters Ltd.	A24b	—	—	—	—	—	—	—	—	X
Redifon Ltd.	A6	—	—	—	—	—	—	—	—	X
Francis Shaw and Co. Ltd.	A25	—	—	—	—	—	X	X	X	—
Universal Tools Ltd.	G47	—	—	—	—	X	—	—	—	—
W.R.C. Ltd.	G37	—	—	—	—	X	—	—	—	—
R. H. Windsor Ltd.	A8/9	—	X	—	—	X	X	—	—	—

Christy and Norris Ltd.	B3	Sprue-cutting machines and disintegrators.
W. Edwards and Co. (London) Ltd.	A26a	Plant for vacuum coating of plastics with metals.
Fescol Ltd.	A24c	Deposition of metal on rams, extrusion screws and other machine parts.
Funditor Ltd.	A26b	Plastics sawing and marking machines.
Kestner Evaporator and Engineering Co. Ltd.	B5	Synthetic resin process plant.
P.A.M. Ltd.	G8	Temperature control units.
Revol Ltd.	B7a	Lubricants and belt dressings.

Redifon, Ltd. (Stand A6)

High-frequency plastics pre-heating and welding equipment is demonstrated at this stand. The equipment includes a high-frequency pre-heater (Type RH.12B) which has an output power of 1.2 kW, for the pre-heating of thermosetting materials; a 350-watt industrial heater (Type RH.24) for the dielectric pre-heating of moulding powder or preforms; a jig welder (Model JP.1) for the high-frequency welding of plastics; an automatic press welder (Type JP.3) for the welding of sheet p.v.c. articles in a single operation; and a box welder (Type JP.4) designed solely for the welding of transparent boxes made from cellulose acetate sheet.

Revol, Ltd. (Stand B7a)

This company show their range of lubricants and belt dressings. "Voler Compound" is the original protective graphite lubricant for use on all medium and heavy gearing, etc., and its use is demonstrated from two gear-driven machines. The new Voler "dry" lubricant is for use where absolute cleanliness is essential.

Rozalex, Ltd. (Stand G49)

The range of barrier preparations made by the company, used under medical supervision, offer defence against the effects of irritants employed in the plastics industry.

Francis Shaw and Co., Ltd. (Stand A25)

Plastics machinery exhibited here includes 16-in. by 8-in. 4-bowl calender, 4½-in. extruder, 1½-in. extruder, K.1 "Intermix," 13-in. by 6-in. mixing mill, and a model of the "Rotocure" continuous vulcanizer.

Universal Tools, Ltd. (Stand G47)

This company are makers of press tools, moulds and jigs. They show products from their tools, together with specimen moulds. A technical representative will be in attendance to discuss moulding problems.

R. H. Windsor, Ltd (Stands A8/9)

This very comprehensive display of thermoplastics moulding plant includes the Windsor S.H.3, S.H.8/10 and S.H.28/32 moulding machines of 3-oz., 10-oz. and 32-oz. capacity, respectively. Also shown are the Windsor R.C.65, R.C.100 and R.C.200 multi-screw extruding-compounding machines, with capacities of 65, 100 and 200 lb. per hour, respectively. The J-C 48-oz. "Universal" hydraulic moulding press, an entirely new production by R. H. Windsor, Ltd., is also exhibited. This machine is a complete departure from conventional design, and can be used for the compression and transfer moulding of thermoplastic material, as well as injection moulding; it was briefly described in "Plastics," May, 1951 (page 141).

British Plastics Convention

Points from Some of the Papers to be Presented

The British Plastics Convention, which is being held in conjunction with the British Plastics Exhibition at Olympia, London, June 6 to 16, has been planned to appeal to technologists within the industry, to users of plastics, and to the general public. The Convention, as an over-riding aim, will demonstrate the importance of plastics in industrial and other non-consumer applications; such an aim is symbolized by the title of the inaugural address, "The Place of Plastics in Industry," to be given by Sir Ben Lockspeiser, F.R.S., on the opening day, June 6. For the technologist, however, the Convention is in the nature of a report on progress in many important fields. Below, we give outstanding points from some of the papers

Progress in Plastics Materials (June 7)

SOME ASPECTS OF SOLID POLYMERS OF ETHYLENE, by J. C. Swallow, Ph.D., A.M.I.Chem.E., Research Director, I.C.I., Ltd. (Plastics Division).

Polythene, like all polymers, has an average chain length and a molecular weight distribution, but at the high pressure and temperature conditions at which it has to be made for economic production, the chains are highly branched, and there is plenty of evidence to show that its unique mechanical properties are due to this structural feature, since polymethylenes made in the laboratory, which are known to be straight chain, are brittle, where a polythene of the same molecular weight is not.

As the molecular weight is raised, the low temperature brittle point will fall, and the useful temperature range is increased, but although the fabrication procedure may not necessarily be more difficult, it will be different. Higher fabrication temperatures must be used throughout and there is a limit above which the original structure will break down unless properly protected. Cooling difficulties also arise from the large coefficient of expansion of polythene and from its crystallinity, for as the outer surface cools the polythene there is the first to crystalize and harden, whilst that inside crystallizes more slowly. In very hard grades this may lead to density differences which equalize slowly with time.

Polythenes may crack when stressed biaxially in contact with certain solvents, which vary greatly in their effect, and this is due to some form of breakdown of the structure of the solid. In all cases this effect diminishes with increase of molecular weight. The immediate problem is to correlate those properties of polythene which can be accurately measured before and during fabrication, with the functional tests of the final plastics articles made from it.

RECENT DEVELOPMENTS IN PHENOLIC MOULDING MATERIALS, by J. H. Bennitt, M.A., F.R.I.C., Research and Development Department, Bakelite, Ltd.

Recent developments in commercially available phenolic moulding materials include high-impact materials, which have, until recently, had the disadvantages of a correspondingly high water absorption and of indifferent electrical properties, as indicated in B.S.771 and in the standards of other countries. The use of asbestos fibre filler provided some improvement and so, later, did the acetylation of cellulose fibre. Higher impact strengths are now available with materials using nylon fabric or glass fabric fillers.

New tropical electrical materials, which give mouldings of standard size in moulds made for general purpose or for H.D. materials, have electrical insulation under tropical conditions about 10 times better than these, and better dimensional stability.

New low-loss materials have recently appeared incorporating nylon fibre filler. These have relatively low electrical losses at high frequency, reduced brittleness, and outstanding resistance to cracking around heavy metal inserts.

Fast-curing phenolic materials have appeared showing savings of 20-30 per cent. in moulding time. Limitations to their rapid adoption include the need for relatively quickly acting presses, and the efficiency of current moulding cycles as at present planned round standard materials. Fast-curing cresol materials have been introduced with speed of cure of the same order as that of standard phenol grades.

New chemical-resistant materials have appeared with unusual resistance to caustic alkalies, which is illustrated. Most fillers give poor resistance to alkalies or poor mechanical strength. Asbestos fibre filler confers good resistance and strength, but has the disadvantages of high specific gravity and indifferent moulding properties. Nylon fibre gives good strength and moulds well.

Phenolic bearing materials have not been utilized as widely as might have been expected. A considerable range is available, all resistant to corrosion and needing no lubrication. Even under severe running conditions, wear of such bearings may be quite slight. A recent development consists of a nylon-filled phenolic moulding material incorporating graphite.

EFFECT OF CROSSLINKING IN VINYL POLYMERS, by J. J. P. Staudinger, Dr.Ing., Director of Research, British Resin Products, Ltd.

In order to form structural elements of greater mechanical and thermal stability from polymer molecules, aggregates of such polymer molecules must be held together by some force, either by a multiplicity of secondary valence forces—hydrogen bonds or dipole moments distributed at frequent intervals along the polymer chain—or by covalent chemical bonds. It is this latter type of tie-up between polymer chains—termed crosslinking — which profoundly affects the properties of a polymer.

To utilize crosslinked styrene polymers, which for practicable purposes are dimensionally and mechanically stable at temperatures up to 160 degrees C., it appears essential, first, to ensure the formation of long primary chains and, secondly, to crosslink these in a ratio of at least 1 divinyl molecule to 50-100 monovinyl molecules.

Plastics in the Chemical Industries (June 7)

APPLICATIONS OF PLASTICS IN THE CHEMICAL AND ALLIED INDUSTRIES, by Verney Evans, M.Sc., A.R.I.C., Special Director and Chief Chemist, Prodorite, Ltd.

Attention is drawn to the good chemical resistance of many plastics and their application possibilities in the chemical industry considered under the three main headings of cements, coatings and linings, and equipment or fittings made entirely in plastics material.

The cements reviewed comprise plasticized sulphur, furane resin and phenol formaldehyde resin cements, the latter also including those derived from cashew-nut-shell liquid resins. These cements are used for the construction of corrosion-resisting floors, drainage channels and tank linings. In the coating field the main emphasis is on the growing use of synthetic resin solutions in solvent for the production of both air drying and stoving coatings.

Linings utilizing polyisobutylene, polythene, polymethyl methacrylate and p.v.c. are considered, with references to the physical and chemical properties of these materials. In the case of polythene, fabrication of linings by heat welding of sheet, the flame spraying of powder and the use of thin foil for underlays for corrosion-resisting floors are described. With p.v.c. the employment of rigid, partially plasticized and fully plasticized products are mentioned.

In the field of completely fabricated equipment, polythene and p.v.c. again take a prominent place. Polythene applications include the fabrication of small tanks, troughs, buckets and other equipment, the construction of ducting and hoods and the important field opened up by polythene pipes.

THERMOPLASTICS IN SERVICE, WITH PARTICULAR REFERENCE TO THE APPLICATION OF UNPLASTICIZED POLYVINYL CHLORIDE, by J. D. D. Morgan, M.Sc., Materials of Construction Section, I.C.I., Ltd. (General Chemicals Division).

Corrosion of equipment represents one of the major problems in the chemical industry; a number of thermoplastic and thermosetting plastics, however, are attractive materials of construction.

Thermoplastics undergo creep even at room temperature and under prolonged loading p.v.c., for example, will fail at a stress of about one-third of its short-time tensile strength. The pioneer work in the large-scale application of p.v.c. for chemical plant was carried out in Germany. The significance of the effect of time on the rupture strength and the parallel with the behaviour of metals at elevated temperature was soon appreciated there. The German specifications and codes of practice are comprehensive. Working stresses of one-quarter of the corresponding long-term rupture strengths at temperature are considered to be safe for p.v.c.

P.v.c. has a high coefficient of expansion and comparatively low strength at elevated temperature, and allowance for expansion must be made in lines carrying hot fluids. Similar considerations to those outlined for p.v.c. apply in the application of polythene and other thermoplastics, but engineering data similar to that published for p.v.c. are not yet available.

Vinyl Formulation and Compounding (June 8)

CHARACTERISTICS OF COMPONENTS AND GENERAL PRINCIPLES OF FORMULATION OF P.V.C. COMPOUNDS, by H. Jones, B.Sc. (Tech.), Technical Manager, Plastics Division, Geigy Co., Ltd.

The choice of the type and amount of various ingredients in the formulation of p.v.c. plastics with respect to the end use of the product and the processing technique proposed is described. Outstanding is the effect of the plasticizer on the polyvinyl resin, and consequently the build-up of the base material considerably influences the selection of the secondary components.

PRODUCTION OF VINYL PLASTICS IN DRY POWDER FORM, by S. J. Skinner, Ph.D., B.Sc., A.I.A.I.(Sc.), Sales Manager, British Geon, Ltd.

The various methods of combining vinyl resins with plasticizers and other ingredients are briefly reviewed and the use of the recently developed multiple screw extruder is discussed. Details are also given of recent work on the production of compound in dry powder form suitable for direct extrusion without further prior gellation.

Plastics in the Textile Industries (June 8)

TEXTILE APPLICATIONS OF AMINOPLASTICS, by A. R. Smith, B.A., B.Sc., A.R.I.C., Chemist in Charge, Textile Research Laboratory, British Industrial Plastics, Ltd.

Butylated amino-resins, normally employed in conjunction with alkyd resin plasticizers for surface coatings, find application as emulsions for the fixation of pigments on textiles, and are capable of producing extremely washproof effects with high resistance to dry and wet rubbing. Resin on the surface of cellulosic fibres has no anticrease effect and reduces tensile strength, but improves abrasion resistance. Resin which penetrates the amorphous regions of cellulose frequently increases the tensile strength of viscose rayon, whereas the strength of natural cellulose is reduced. Better shrinkage control of wool is obtained with more highly condensed resins.

PLASTICS AND THEIR APPLICATION TO EQUIPMENT IN THE TEXTILE INDUSTRY, by Alan Beecham, A.M.I.P.E., Manager, Moulding Department, Courtaulds, Ltd.

The use of plastics in the textile industry can be classified in three sections: those to resist chemical attack, those where high mechanical strength is required and, thirdly, where high finish is desired. Certain barriers exist, particularly in respect to the traditional uses of wood; adaptation to existing equipment is also a problem.

The modern version of the Topham spinning box is an outstanding example of successful application of plastics to the rayon branch of the industry. The resistance to chemical attack while subjected to the high stresses of the spinning operation affords highest credit to the plastics material used. The high mechanical strength of some modern plastics provides unlimited scope in the manufacture of bobbins and spools, etc., from a winding spool of simple form and low cost to the high-speed twisting and spinning bobbins of fine balance and high precision.

The nuisance of noise in connection with textile machinery could be reduced by the use of plastics, particularly with reference to gearing. Laminated materials could be applied very profitably on the same equipment, particularly on weaving looms.

Forum on Buying and Selling (June 9)

PLASTICS FROM THE DOMESTIC CONSUMER'S VIEWPOINT, by Stanley Carter, A.T.I., Group Merchandise Manager, Selfridges, Ltd.

Failures of plastics in performance and quality have indicated generally that materials were used for unsuitable purposes; secondly, raw material was poor; thirdly, design of a suitable application was bad; finally, insufficient guidance was given to retailer and customer on the properties of plastics and the handling of plastics products.

The plastics industry has now an unequalled opportunity to restore itself in the public's confidence. Steps which would help this process include efforts by manufacturers to prevent wrong uses and to ensure development of new and suitable applications; the employment of only top-grade materials; maintenance of a high standard of design, quality and finish; and instructive sales promotion.

SELLING PLASTICS—THE MANUFACTURER'S VIEW, by T. L. Birrell, M.A., B.Com., Managing director, Halex, Ltd., director, British Xylonite Co., Ltd.

Much of the misunderstanding and confusion concerning plastics arises from a lack of appreciation of the differences between the various plastics. Manufacturers selling plastics to industry have to appreciate different problems, provide a different service and sell to more rigid specifications than when they sell for the consumer market. In the latter, selling is complicated by the public's lack of knowledge of plastics, and by yet undeveloped informative labelling.

CERTIFICATION MARKS AND INFORMATIVE LABELLING, by W. E. De B. Diamond, M.A., Ph.D., F.R.I.C., F.C.I.S., General Manager, British Plastics Federation.

True Synthetic Fibres (June 11)

TERYLENE, by A. Renfrew, B.Sc., Division Director, I.C.I., Ltd. (Plastics Division).

Terylene will be manufactured in Great Britain from oil-cracking products. Its most important applications will be in the textile industry, but, like nylon, it may find applications in forms other than that of fine filaments. Fine filaments are manufactured by extruding the molten compound through tiny holes in steel plates. These filaments must be orientated to increase their strength and to improve their physical properties. This orientation is done by stretching at high temperature. Subsequent relaxation treatments may or may not be given.

THE PHYSICO-CHEMICAL BACKGROUND OF SYNTHETIC FIBRES, by Prof. E. K. Rideal, Department of Chemistry, King's College, London.

Plastics in Building and Architecture (June 11)

THE ARCHITECT AND PLASTICS, by Gontram Goulden, T.D., A.R.I.B.A., Technical Officer and Deputy Director, The Building Centre.

In sheet materials manufacturers have gone out of their way to produce finishes in imitation of other materials and while all sheet materials have their limitations, plastics sheeting has its own particular shortcomings, not the least of which is its high price. Plastics floor coverings, whether in tile or sheet form, have many good points, but do not yet compete on equal terms with traditional materials. The architect feels that the plastics industry could provide him with the type of material that he wants if it would listen to him. He wants resin-bonded ply, well-designed door furniture and electric light fittings, hard-wearing non-slip floor coverings and moulded ware that does not fly to pieces at a touch.

WHAT THE PLASTICS INDUSTRY OFFERS THE BUILDING INDUSTRY, by H. H. Lusty, A.M.I.E.E., Marketing Manager, Bakelite, Ltd.

The plastics manufacturer, in replying to the criticisms of the architect, deplores the use of the word "substitute" as applied to plastics, but agrees that the bad performance of plastics under certain conditions has been due to bad design and to the misapplication of plastics. It is in the sphere of "structural components" that the most recent developments have taken place. These include the wide use of corrugated acrylic sheeting for factory roof lights, and formed acrylic sheet for fluorescent lighting reflectors and fittings.

High-pressure laminates for wall panelling, door and furniture surfacing, have been greatly improved by the use of melamine facing papers, and new techniques developed for the incorporation of printed patterns and original drawings under the surface. Designs in relief and facings of high-pressure laminates on relatively thick aluminium cores are now available, greatly extending the usefulness of these materials, and enabling some of them to be used out of doors with confidence. Corrugated high-pressure laminates have been used for exterior walling for schools.

Developments in Synthetic Resins (June 12)

SYNTHETIC RESINS AS FOUNDRY SAND BINDERS, by P. G. Pentz, B.Sc. Technical Sales Manager, Leicester, Lovell and Co., Ltd.

Thermosetting resins, especially phenol-, urea-, and melamine-formaldehyde resins, have recently come into large-scale use as binders for foundry core sands. Resin-bonded sands can be produced with all the properties essential to satisfactory operation under normal foundry conditions, together with new advantages, which include better bench-life, faster baking, lower fuel consumption, less core breakage, less gas evolution during casting, less smoke and fumes, easier knock-out, improved casting finish and lower fettling costs.

The use of aqueous or alcoholic solutions of phenol-formaldehyde resins as core sprays, either alone or as media for refractory coatings, produces an extremely hard water-resistant shell or skin on the baked core.

UREA AND MELAMINE RESINS IN SURFACE COATINGS, by F. Schollick, B.Sc., F.R.I.C., Chemist in Charge, Lacquer-resins Research Laboratory, British Industrial Plastics, Ltd.

Quick-hardening stoving lacquers are now demanded for the rapid production of surface-coating films or finishes. Such finishes are based on a non-volatile medium of resins with or without modifying oils, hardening on heating by oxidation, condensation or polymerization.

Urea and melamine coating resins have been proposed for use with film-forming materials, such as the following, presumably on account of their cross-linking reactivity: polyvinyl acetal (Formvar); polyvinyl butyral; styrenated alkyd resins; epichlorohydrin diphenol resins; cellulose ethers (ethyl cellulose, benzyl cellulose); cellulose acetate; phenolic resins; silicones.

SOME INVESTIGATIONS INTO THE FUNDAMENTALS AND APPLICATIONS OF ADHESIVES, by N. A. de Bruyne, M.A., Ph.D., F.Inst.P., Managing Director, Aero Research, Ltd.

Developments in Processing Plant (June 13)

DIES AND TAKE-OFF SYSTEMS FOR THERMOPLASTIC EXTRUSION, by Edwin G. Fisher, Chief of Extrusion Development, R. H. Windsor, Ltd.

The present-day requirements of an extrusion plant are that it should give long runs of dimensionally accurate products of good finish with the minimum of attention by the operator. In a set-up to do this, the die and take-off assume an importance at least as great as that of the extruder.

Basically, most extrusion dies are very simple, consisting merely of an orifice of suitable shape and dimensions in a plate of sufficient strength to withstand the extrusion pressure. In order to achieve long, uninterrupted runs of work without thermal decomposition of the plastics material, a successful extrusion die becomes more complicated. Attention must be given to the speed of movement and relative temperatures of the thermoplastic through and around the various die parts, such as breaker plate, torpedo and mandrel. If the plastic stream is broken up in going through a spider, for example, it must be reconsolidated before reaching the die land. Many products, particularly rigid and semi-rigid tubes, are best produced by extruding into a chilled forming die.

Types of extrusion dies and dieheads may be divided broadly into three groups:—

(a) Straight head dies which are used for the extrusion of tubes and sections and generally for extrusions which do not involve the introduction of an article, to be covered, into the plastics stream.

(b) Crosshead dies which are arranged at an angle, usually 90 degrees, to the extruder. These are much used for wire and cable manufacture, and for the plastics coating of suitable articles, but are very useful for other products due to their accessibility and adaptability.

(c) Mechanical dies. These are usually crossheads to which some driven mechanical attachment has been added to give a desired effect to the extruded product.

The take-off system forms the final link in the chain between plastics raw material and the finished extruded product. Sometimes it is merely a conveyor band for taking the extruded product away, and sometimes it is a specially designed unit devised to handle a specific product. Into this latter category come take-off systems for polyethylene and vinyl layflat tube, vinyl and acetate sheets, wire and cable covering, polystyrene colouring and the manufacture of pipes in polyethylene, hard vinyl and cellulose acetate.

PLASTICS CALENDERING—TYPES OF MACHINES AND LAYOUTS, by Joseph Brown, M.I.Mech.E., F.I.R.I., Technical Director, David Bridge and Co., Ltd.

It is considered that the four-roller calender gives the best all-round performance on plastics; recently roller diameters have been increased to reduce the need to correct deflection. The high temperatures involved in plastics calendering require a fluid oil lubricating system to stabilize the thermal conditions of the calender bearings and to ensure the flow and control of sufficient lubricant, with electro-mechanical devices to ensure that the calender cannot be run unless the lubricating system is functioning correctly. This method of lubrication also plays an important part in reducing temperature gradient across the roll face.

Subsidiary equipment for handling unsupported plastics sheetings and plastics-coated fabrics has been studied carefully so that the hot film can be stripped from the calender roller, cooled, trimmed and wound up at high calender speeds without loss of gauge and with a minimum of orientation. Normally one of two systems is used for unsupported sheetings, either the driven multi-cooling drum method, with surface contact wind-up on the final drum, or the cooling and stripping drum method combined with surface cooling conveyors, festoons and surface contact wind-up. For high calendering speeds, a large battery festooner is essential if the batch rollers are to be changed without reducing the calender speed unduly. Mechanical or electrical compensation is incorporated in the subsidiary equipment to synchronize the different phases of the cooling and wind-up operation with the calender.

BASIC FEATURES INFLUENCING THE PERFORMANCE OF INJECTION MOULDING MACHINES, by E. Gaspar, Dipl.-Ing. E.T.H. Zurich, A.M.I.Mech.E., Chief Designer, Projectile and Engineering Co., Ltd.

The main characteristics which influence the performance of injection moulding machines are shot capacity, plasticizing capacity, rate of injection, mould locking force and injection pressure. Shot capacity should be expressed in volume which could be consistently injected with one plunger movement. Plasticizing capacity, measured in pounds per hour, depends to a large extent upon the size and efficiency of the plasticizing chamber.

The ratio between the plasticizing capacity and the maximum shot capacity with different sizes of machines is discussed, together with various suggestions which have been put forward to overcome certain limitations. One of these suggestions, i.e., the use of a preplasticizing chamber, is also discussed and an attempt is made to determine the size of the machine where preplasticizing would become desirable. The maximum locking force on any machine determines only very approximately the maximum projected area obtainable, and the variations which are due to injection pressure drops, temperatures, etc., are discussed in some detail.

It has been established that the mould pressure cycle can be divided into certain periods, such as the mould filling period, pressure build-up phase, etc. It has also been established that the influence of injection pressures, injection temperatures, mould temperatures, speed of injection, curing time, nozzle size and gate size, the holding-on period at the end of the injection stroke and the humidity of the moulding powder, determine to a large extent the mould pressure cycle and residual pressures when the mould opens. Thus the correct relationship of the above determine the quality of the mouldings.

Plastics in the Transport Industries (June 13)

PLASTICS IN ELECTRICAL ENGINEERING FOR THE AUTOMOBILE INDUSTRY, by A. A. Tomkins, of Joseph Lucas, Ltd.

Components for distributors, switch bases and regulator boxes are still purely functional, but there is a trend towards better styling. Insistence on quality is an overriding factor simply; failure may cost lives. Applications of plastics especially useful to the industry include moulded meter cases with case and "glass" in one methylmethacrylate moulding, the marrying of zinc-base die-castings and thermosetting mouldings, and the use of three-dimensional decorative insignias for horn pushes, motifs, and the like. An important application lies in the use of transparent mouldings with optical finish and extreme accuracy of form for "reflex" reflectors for various purposes.

With this emphasis on function and quality, the selection of materials is of prime importance—good electrical properties are required, dimensional stability on ageing must be ensured, and materials must be consistent from batch to batch, even from year to year, if confidence in the products is to be maintained. Out-of-the-ordinary materials are required for many purposes, e.g., materials with little tendency to "track" with ignition sparks are required for high-tension components, the toughness and heat resistance of moulded nylon is required in horn construction, and Teflon is considered for small, heavily loaded bearings.

AIRCRAFT PLASTICS STRUCTURES, by H. Warburton Hall, M.Sc., and J. E. Gordon, B.Sc., Royal Aircraft Establishment, South Farnborough

The rapid advances in recent years in aircraft speed and altitude of flight, and in the use of radio and radar aids to navigation, etc., have resulted in more exacting service demands on the performance and reliability of plastics materials used for optically and electrically transparent aircraft structures.

Besides good optical properties, plastics for use for aircraft windows, canopies, etc., are needed which have improved shatter resistance, particularly under cabin pressurized conditions, better low- and high-temperature performance and requisite ultra-violet and infra-red absorption properties. Similarly, electrically transparent plastics materials for radio and radar scanner housings, "radomes," etc., are required which have improved electrical and mechanical properties under extreme flight and climatic conditions, and which lend themselves to improved methods of precision fabrication of large structures to close tolerances. Intensive efforts are being made to develop materials and methods of fabrication to meet these exacting demands.

Serious consideration is being given to the development of plastics airframes, the advantages sought being cheapness, quicker

production, weight saving, heat and sound insulation, and radio transparency. Projects now in hand include pairs of wings for a high-speed aircraft. For a number of reasons, attention has been concentrated upon resins of the phenolic type with asbestos reinforcement, though plastics of the glass cloth-polyester type are utilized where they show advantages. These mouldings, which are of an elaborate nature, are mostly made at atmospheric pressure in comparatively simple moulds, and novel moulding techniques have been developed.

PLASTICS IN SHIP CONSTRUCTION, by E. C. Leach, F.R.I.B.A., Decorative Architect, Cunard Steam-Ship Co., Ltd.

Progress in the use of plastics in ship construction continues to expand. The most economical wall surface is hardboard covered with a plastics fabric. Mention is made of laminated sheet, panels, interlocking tiles, and p.v.c. leathercloth; limitations and some deficiences noted in practice are reviewed. The wearing qualities of cretonne impregnated with p.v.c. are mentioned. Attention is drawn to the limited designs available in fabrics woven from finely extruded plastics and plastics-covered fibre filament, and to the replacement of cane in wicker furniture by extruded plastics rod.

The small tensile strength and low range of working temperatures of plastics materials limits their use in marine engineering. A plea is made for a new moulding system to reduce the present high costs of moulding.

Techniques of Fabrication (June 14)

SELECTION OF PHENOLIC MOULDING MATERIALS WITH REGARD TO MECHANICAL STRENGTH, by Stanley A. Ede, Technical Director, James Ferguson and Sons, Ltd.

The strength of phenolic mouldings is dealt with broadly from two aspects—reinforcement and stability. Woodflour, though entirely satisfactory for many articles, often fails through having insufficient dimensional stability. Cotton in several forms is used for improving stability, but principally to confer reinforcement. Ground cotton linters double the impact strength. Yarn or fabric can give 10 times the impact strength afforded by woodflour.

Woodflour and cotton-filled materials, even though they may be strong enough for many applications, still fail through lack of dimensional stability, even under atmospheric influence or under conditions of heat, moisture, etc., and often the use of a mineral-filled phenolic is necessary to make a serviceable moulding. Asbestos is one filler commonly used to obtain dimensional stability in such circumstances, and in addition, some degree of strength. Mica is also frequently used.

CONTINUOUS EXTRUSION OF THERMOSETTING MATERIALS, by D. N. Davies, B.Sc., A.R.I.C., A.M.I.Chem.E., F.P.I., Manager, Moulding powders technical service, British Resin Products, Ltd.

The extrusion of thermosetting materials to give unlimited lengths of accurately dimensioned sections was pioneered in Germany before the war. Unlike the extrusion of thermoplastic materials, it is not widely practised, nor are its possibilities as yet fully appreciated.

In this process, phenolic or urea thermosetting moulding materials are subjected to a form of continuous compression moulding in a special press provided with an automatically reciprocating hydraulic ram. The material is forced under high pressure through an elongated die, of which the temperature progressively rises from the intake end to the outlet. The outlet is closed only by the already formed and fully hardened section. The pressure necessary for consolidation is thus provided by the hardened section as it moves forward under restraint arising from friction between its surfaces and the walls of the correspondingly shaped die. The die is substantially parallel along the greater part of its length.

Phenolic and urea moulding materials of the woodflour-filled type are employed most generally, but some special purpose thermosetting grades, including those with improved electrical and shock-resisting qualities can be extruded. This process provides sections with high dimensional accuracy and durable finish.

PROBLEMS OF MIXING IN EXTRUSION, by D. Grant, B.Sc.(Eng.), A.C.G.I., Research Department, and W. Walker, M.A., Technical Service and Development Department, I.C.I., Ltd. (Plastics Division).

Whilst each extruded section and each composition demands a specific set of conditions for obtaining the best results, there are some fundamental requirements that are common to all extrusion work. One such basic requirement is to ensure that the plastics melt at the die is homogeneous in both composition and temperature. All plastics are poor conductors of heat and care must be taken to avoid a large temperature gradient from the hot cylinder walls to the centre of the melt. This can be done by using lower cylinder wall temperatures and generating the heat internally by mechanical work on the plastics. High-powered extruders giving high screw speeds and capable of withstanding high internal pressures are required for this work.

Plastics in Surgery and Medicine (June 14)

The following papers are included in this section of the Convention:—

SYNTHETIC RESINS AND THEIR INTERNAL APPLICATIONS IN SURGERY, by John T. Scales, M.R.C.S., L.R.C.P., Plastics Research Unit, Institute of Orthopædics, National Orthopædic Hospital, Stanmore, Middlesex.

A NEW METHOD OF MAKING BRONCHO-PULMONARY CASTS OF HUMAN LUNGS IN THE FULLY EXPANDED POSITION, by David H. Tompsett, Ph.D., Royal College of Surgeons.

USE OF NYLON FILM IN SURGICAL DRESSINGS, by Prof. John R. Squire, M.D., F.R.C.P., Leith Professor of Experimental Pathology, University of Birmingham.

Plastics Film Production and Handling (June 15)

PLASTICS FILMS—THEIR MANUFACTURE AND PROPERTIES, by Maldwyn Jones, B.Sc., F.I.R.I., Manager, Technical Service and Development Department, I.C.I., Ltd. (Plastics Division).

The most recent methods of film production are those based upon dry extrusion. Polystyrene film was produced in this way, either flat or as a tube, and products having useful properties were obtained by subjecting the film to a two-dimensional stress immediately after leaving the extruder. This resulted in a stretch of about 3 : 1, and by using polymer having a molecular weight of 80-100,000, film was claimed to have a tensile strength of 700 kg/cm^2 and an elongation of 3-4 per cent.

The later polythene film development has been conducted along two parallel lines, namely wide flat film and tubular or layflat film, the latter being the most widely used. Films as thin as one-thousandth of an inch have been produced in this way.

A flat-film unit consists of a screw extruder, a die with a long slit orifice, a cooling drum or water bath, and a suitable wind-up mechanism. The flat-film process usually requires a higher temperature than the tubular method. The physical and mechanical properties of the film are dependent, of course, upon the quality of the polymer, but they may be controlled by the degree of orientation, the temperature of extrusion, and the rate and manner of cooling. High temperatures usually mean high rates of production, good physical properties and high clarity. Lower temperatures tend to give less clear films, but improved handling and slip characteristics.

HEAT SEALING AND WELDING OF PLASTICS, by G. Haim, Dipl.Ing., General Manager, and H. P. Zade, Dr.Ing., Technical Manager, Rediweld, Ltd.

The release of large tonnages of polythene in the post-war period is responsible for the enormous growth in the use of polythene as a packaging medium. A great variety of heat-sealing machines ranging from simple hand- or foot-operated models to completely automatic heat sealers, most of them using the impulse technique, are the result of this development.

INKS FOR THE PRINTING OF PLASTIC FILMS, by Hubert A. Idle, Director of Research, Ault and Wiborg, Ltd.

Printing inks have to satisfy many and exacting conditions in the decoration of plastics films. On the printing press the ink must be a highly stable dispersion of a colourant in a fluid media and yet as soon as it is transferred to the film it must convert to a solid film having properties resembling the plastics itself in flexibility and extensibility. Each plastics film is of necessity a separate problem to the ink maker and even the surface variations to be found in any type of plastics film demand separate treatment. The end use of the film must also be known to the ink maker.

Plastics in Packaging (June 15)

PLASTICS AS PACKAGING MATERIALS, by G. L. Riddell, Ph.D., F.R.I.C., Director of Research, Printing, Packaging and Allied Trades Research Association.

Plastics have many applications in packaging; for example, in the manufacture of closures, wads, transparent films, adhesives, lacquers and coatings for metal and paper, strip-coats, papers of high wet strength, plywoods, fabricated containers, moulded containers, cushioning materials and cocooning compounds.

APPLICATIONS AND MANIPULATION OF THERMOPLASTIC MATERIALS IN THE PACKAGING INDUSTRY, by W. T. Simpson, Manager, Industrial Division, Cascelloid, Ltd.

Polythene is used for making bottles by means of the Plax extrusion blow technique. Polythene tubing is extruded and blown by air pressure into the form of a mould. Production rate is 10 bottles per minute.

New Productions

Tripping Peg

The accompanying photograph of the top of a Chambersburg drop stamp hammer rising on its upward stroke has been sent to us by Tufnol, Ltd., of Perry Barr, Birmingham, 22B. It shows the application of "Tufnol" for a drop stamp hammer tripping peg, which can be seen just about to strike the tripping mechanism which will release the tup to fall on its downward stroke. This is a specially interesting instance of where a British-made plastics material is helping one of the most important industries in the United States.

When a productivity team representing the British drop forging industry visited America some time ago, they noticed that the striking pegs in the tups on all Chambersburg drop stamp hammers in use were either of lignum vitæ or of teak. It was further ascertained that a peg usually struck the tripping mechanism 8,000 to 9,000 times each day, and that the average life of each peg was about four weeks. On the contrary, in most parts of Britain such wood pegs are now considered obsolete for this service. Replaced by "Tufnol," they last about 12 months, and usually withstand 2,250,000 blows before requiring replacement.

Evidence of the interest the British productivity team left behind was subsequently reflected in a request from America for specimens of "Tufnol," duly followed by an order for "Tufnol" tubes, which had proved most satisfactory under tests, even to the extent of sustaining 2,800,000 blows before having to be discarded owing to abrasion.

Indicator Board

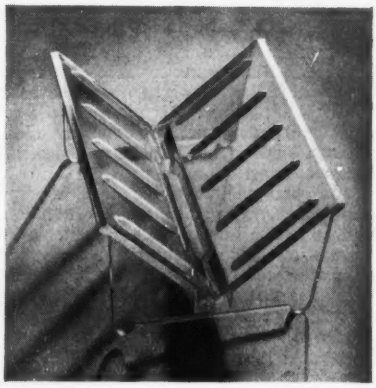
The indicator board illustrated was made for Scruttons Ltd. by the London Label Co. (1921) Ltd., 253a, Beckton Road, Victoria Docks, E.16. The main construction is of ¼-in. opal "Perspex," with runners of the same material into which interchangeable engraved "Ivorine" tablets are inserted. A quantity of coloured "Erinoid" studs were also supplied, each group of colours indicating an item of mechanical equipment, so that when pegged into position it is possible to see at a glance the location of any particular item. The board measures 36 ins. by 24 ins. and is jig-drilled with upwards of 1,500 holes to receive the studs. Scruttons Ltd. say that the saving in time effected by the introduction of this indicator board is incalculable, apart from the added efficiency achieved by maximum use of all items of equipment.

Educational Money

Schools are now using imitation money tokens in teaching arithmetic and also to introduce children to the art and mystery of shopping. Cardboard coins have been in general use for many years, but these leave something to be desired in terms of hygiene and durability. Dines Products, of Stanley Road, Grays, Essex, are now producing in cellulose acetate, by injection moulding, a series of money tokens designed specially by educational experts, for Philip and Tacey, Ltd., of Fulham, London. These plastic tokens avoid any graphic resemblance to the official Mint coinage, but are sufficiently suggestive of the real thing for each separate denomination to be easily identifiable by young children. Eight denominations are in the series, which are being manufactured under Registered Design No. 864438.

Soap Stand

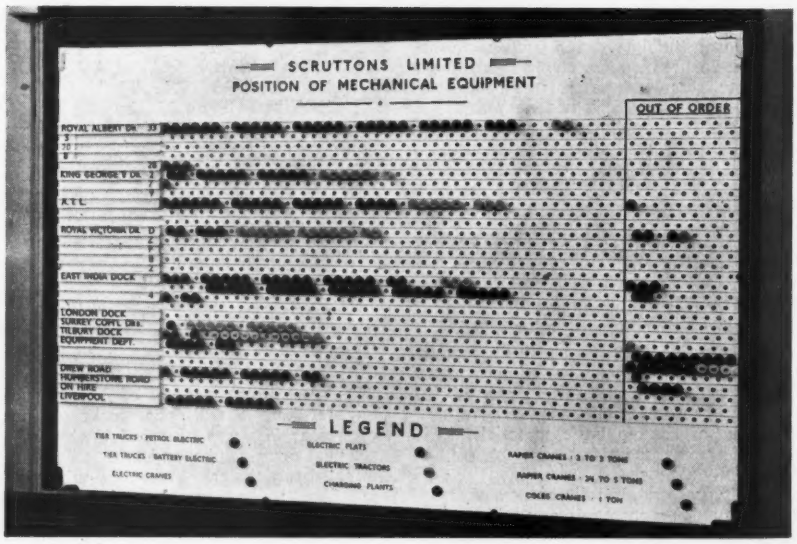
This new design in soap stands is moulded in pale pink crystal polystyrene by Universal Metal Products, Ltd., Langley Road, Pendleton, Salford, Lancs. It is of adequate size to hold a normal size tablet of toilet soap, and the base is so designed to stand firmly on the wash-basin without risk of being easily knocked over. The slot in the base allows the excess moisture to drain away, leaving the soap firm and dry for future use. This article can, of course, be moulded in other materials and in shades to tone with any bathroom decor.



(Above) Soap stand of novel design (polystyrene).

(Left) Educational money (cellulose acetate).

(Below) Indicator board ("Perspex" and "Erinoid").



PRODUCTION NEWS

Raw Materials, New Plant, Works Organization, Control Apparatus, Research, Personal and Trade Notes

HYDRAULIC ACCUMULATOR.—The accompanying photograph shows the G.M.F. type hydraulic accumulator (Brit. Pat. 572,725 and 595,165) made under licence by Finney Presses, Ltd., Berkley Street, Birmingham, 1, which was exhibited at the Birmingham Section of the 1951 B.I.F.

The shell of this equipment is made from a single piece of alloy steel without seams or joints, homogeneous throughout and especially processed to provide a high factor of safety. The separator bag is normally made of synthetic rubber compound, but is also obtainable in other compounds depending on the fluid used in the system. An integrally moulded high pressure air valve with a removable core permits pre-loading the bag with air or nitrogen, from an external supply. The bag is capable of satisfactory operation between 40 degrees F. below zero and 180 degrees above zero.

The oil discharge plug is installed in the wide port in the lower end of the shell and is so designed that it provides a maximum flow and permits unrestricted flow of oil. A forged steel spring-loaded poppet valve is used to control the flow of oil, maintain high volumetric efficiency, and prevent extrusion of the rubber bladder through the plug. A safety feature is incorporated in the design of the plug assembly; the plug cannot be removed unless all air pressure is first exhausted from the bladder.

The nominal six-gallon size accumulator has an initial charging load in the bag equal to 1,000 p.s.i.; working pressure (min.), 2,000 p.s.i.; working pressure (max.), 3,000 p.s.i.; the actual storage volume under these conditions being 277 cubic ins. A variety of sizes from 50 to 500 cubic ins. will shortly be available.

PIPE LINE INDENTIFICATION.—During the past 20 years three British Standards have been published dealing with the identification of piping, and certain anomalies have arisen. In order to remove these difficulties, and to co-ordinate requirements, a new code has been prepared to replace B.S.457—"Identification of chemical pipe lines." B.S.617—"Identification of pipes, conduits, ducts and cables in buildings," and B.S.3011—"Identification colours for engine-room piping."

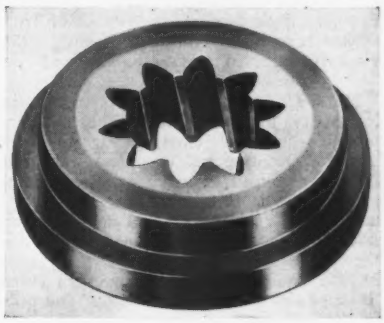
The new Standard (B.S.1710, of 1951) provides primary identification colours which indicate the class of content in pipe lines, these colours being applied along the length of the pipe or in broad rings, as desired. Copies may be obtained from the British Standards Institution, Sales Department, 24, Victoria Street, London, S.W.1, price 2s. 6d. post free.

TECHNICAL INFORMATION AND DOCUMENTS.—The Technical Information and Documents Unit, which for a number of years has been attached to the Board of Trade, has now become part of the Information Services of the Department of Scientific and Industrial Research. For the present the unit remains in Lacon House, Theobalds Road, London, W.C.1, where it continues to hold at the disposal of industry the large collection of unpublished documents which contain valuable information on the production and use of substitute materials.

BUILDING CENTRE IN HONG KONG.—It is proposed to set up a Building Centre in Hong Kong, on the lines of the Centre now established in London. The purpose is to provide a permanent exhibition, where every type of building material can be displayed and demonstrated under working conditions. A reference library concerning building materials not normally obtainable in Hong Kong will be maintained. The body responsible for the new Centre is Hong Kong Building Service, Ltd., 117, Prince's Building, Ice House Street, Hong Kong. They will be glad to receive from United Kingdom manufacturers' technical and commercial data about products, even if manufacturers are not immediately interested in export orders.

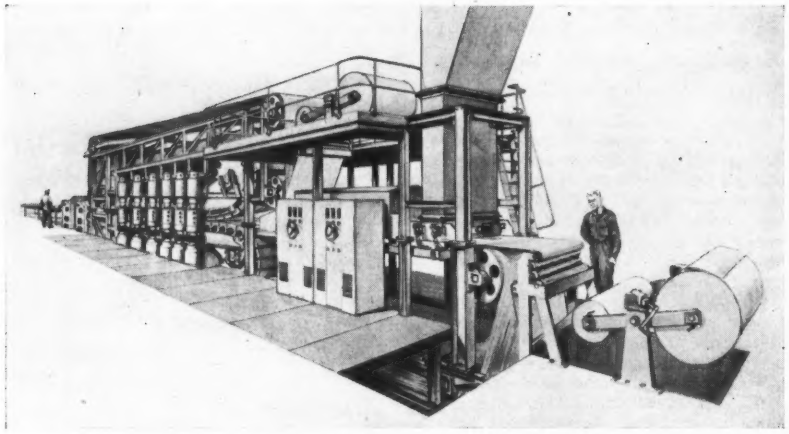
PATENT OFFICE LIBRARY.—The Board of Trade announces that the Patent Office Library at Southampton Buildings, Chancery Lane, London, W.C.2, is now open to the public from 10 a.m. until 9 p.m., Mondays to Fridays inclusive, instead of closing at 6 p.m. Saturday opening continues to be from 10 a.m. to 5 p.m.

ELECTROFORMED DIE.—The photograph we reproduce shows a die for a helical gear wheel, which the London and Scandinavian Metallurgical Co., Ltd., Gonsalva Street, London, S.W.8, have made by electroforming, for Ets. Mecano-Plastique, Suresnes, Seine, France. The gear wheel, also seen, is for use in a meter, and is to be moulded in either nylon, acrylic material or polystyrene, using a vertical injection machine equipped with a helical ejector. We understand that this is the first time that an electroformed die has been made for a helical gear wheel.



(Right) Helical gear wheel, moulded from an electroformed die (above) made by London and Scandinavian Metallurgical Co., Ltd.

(Above) new travelling showroom of Tufnol, Ltd., Perry Barr, Birmingham. The interior (right) includes a lathe and other equipment for demonstrating the machining properties of "Tufnol" materials.



Artist's impression of the new "Celloboard" machine for the production of continuous sheet material (Vere Engineering Co., Ltd.).

GERMAN PLASTICS CONFERENCE. The German Plastics Association informs us that the next German Plastics Conference will be held in Wiesbaden, October 22 to 27, 1951. It is hoped that a number of prominent foreign members of the plastics industry will be able to take part in the Conference. Further particulars can be obtained from Organisationsburo, Kunststoff-Tagung 1951, Frankfurt-am-main, Hauptbahnhof 12IV.

POLYTHENE.—Because of substantial increases in the cost of industrial alcohol, the present source of ethylene for polythene manufacture, Imperial Chemical Industries, Ltd., are obliged to make a corresponding increase in the price of their "Alkathene" materials. Previous alcohol cost increases had been borne without increasing polythene prices, but part of the latest rise (from 38d. to 82d. per bulk gallon on April 1) has to be passed on to the consumer. The price of "Alkathene" granules, in lots of 1 cwt. and over, will now be 4s. 3d. per lb. Other polythene materials are proportionately affected.

When I.C.I.'s oil-cracking plant at Wilton comes into operation—it is hoped towards the end of this year—substantially cheaper ethylene will be available. It may then be possible to reduce the price of polythene, while at the same time polythene production will be increased over the present level.

LAMINATES.—Under an Order by the Board of Trade, operating from May 14, 1951, licences will be required in respect of the export to all destinations of fibre building board, including hardboard, insulation board and laminated wallboard.

CRYSTALATE, LTD., held their annual general meeting in London on May 10. In his speech, Sir Herbert Morgan, chairman, said the results of the year show, before taxation, a considerably reduced loss of £3,055 as compared with £7,166 last year. The year's consolidated accounts include 15 months' figures for Mica Products, Ltd., and Crystalate (Printing), Ltd., in order to bring their year into line with the parent company. Since the removal of Mica Products, Ltd., from Dalston to Tonbridge, improvement has been maintained and the immediate future can be visualized with optimism. Available internal figures of Ebonestos Industries, Ltd., for the year to March 31, 1951, also show satisfactory improvement. Regarding the parent company, Crystalate, Ltd., internal figures for the period from October 1, 1950, to date show that the position is definitely brighter and business appears to be on the up grade.

BRITISH XYLONITE CO., LTD.—In his statement submitted to shareholders at the annual general meeting of the company, May 31, Mr. C. F. Merriam, chairman, pointed out that the improvements which were apparent at the date of his last annual statement in 1950 continued throughout the year. The combined trading profit of the group rose from £528,000 to £956,000, and although depreciation and obsolescence increased by a further £36,000 to a figure approaching a quarter of a million pounds, the profit before providing for taxation at £693,000 was considerably more than double the amount for 1949.

SCINTILLEX, LTD.—Mr. A. J. Waixel has been appointed sales manager of Scintillex, Ltd., the company which is responsible for selling the output of the factory at Christchurch, operated by the British Xylonite Co., Ltd. (Scintillex Division). The company specialize in fancy jewellery and accessories, buttons, etc., and has recently added sewing sets and manicure sets to their range of productions.

MONSANTO CHEMICAL CO., St. Louis, American associates of Monsanto Chemicals, Ltd., inform us that Dr. Charles Allen Thomas has been elected President of the Company. He succeeds Mr. William M. Rand, who has been President since October, 1945.

MR. NORMAN ROSEDALE, managing director of Rosedale Associated Manufacturers Ltd., left London Airport for New York on May 16. Travelling with him were his chief designer, Mr. Norman Hollis, and Mr. Bohan, a director of Mr. Rosedale's associated company, Manwood Engineering Co. Ltd. Mr. Rosedale is visiting America to tie-up a deal he made during the B.I.F. with Mr. Islyn Thomas, president of the Thomas Manufacturing Corp., Newark, N.J., and president, Newark Section, Society of Plastics Engineers. The deal involves the use of British-made tools and moulds for the injection moulding of plastic toys in the United States. In this way British toy manufacturers are overcoming the 75 per cent. tax imposed on British toys.

BIRMINGHAM COLLEGE OF TECHNOLOGY will offer a new full-time course in Plastics Technology during the Session 1951-52, commencing in September. Successful completion of the course will lead to the award of the College Associateship (A.C.T. Birmingham) and provides an adequate preparation for the Associateship Examinations of the Plastics Institute in either Section A (Chemistry) or Section C (Engineering). A period of industrial training and experience is provided between the two years of the course. Practical instruction in technology is given in the well-equipped plastics laboratory containing both pilot-scale and full-scale plant of varying types for the manufacture of synthetic resins, plastics materials and for carrying out the usual shaping processes. Both chemical and physical examination of materials and products is undertaken and the laboratory is well fitted for the experimental study of fundamental and industrial problems. Candidates for admission to the Course should apply to The Registrar, College of Technology, Suffolk Street, Birmingham, 1.

Princess Margaret makes a moulding on Type 40 auto-control "Bipel" press at the Birmingham B.I.F. stand of B.I.P. Engineering Ltd., and discusses it with Mr. R. Groves (left), hydraulics development engineer, B.I.P. Engineering Ltd. On the right is Mr. J. E. Beard, managing director of the Streetly Manufacturing Co., Ltd., and director of B.I.P. Engineering Ltd.

Machines for the Industry

"Westminster" Injection Moulding Machine

Dowding and Doll, Ltd., have long been associated with the plastics industry, having brought the first automatic injection moulding machine into this country in 1934. Their "Westminster" machine, described in this article, was introduced in 1945.

THE "Westminster" hand-operated injection moulding machine is designed for the continuous production of small mouldings up to ⅛ oz. and 5 sq. in. projected area. Production can be very rapid, the main controlling factors being the shape and section of the moulding and the design of the mould.

The machine consists of a robust steel base (1) and two main support brackets (2), all of welded-steel construction. The support brackets, one fixed at each end of the base, are connected together by two heavy parallel tie bars (3). Between these brackets are arranged an anchor plate (4), which is adjustable for die height, an actuating shaft (5) and adjustable support bearings (6) carrying the toggle mechanism (7), movable injection-plunger crosshead (8), movable material-cylinder crosshead (9), and movable platen (10). All moving mechanism is maintained in perfect alignment by being guided by the parallel tie bars and held in position by springs and distance rods with stops. "Oilite" oil-retaining bushes are fitted to the moving platen and crossheads to minimize wear of the tie bars and add to the ease of operation of the machine.

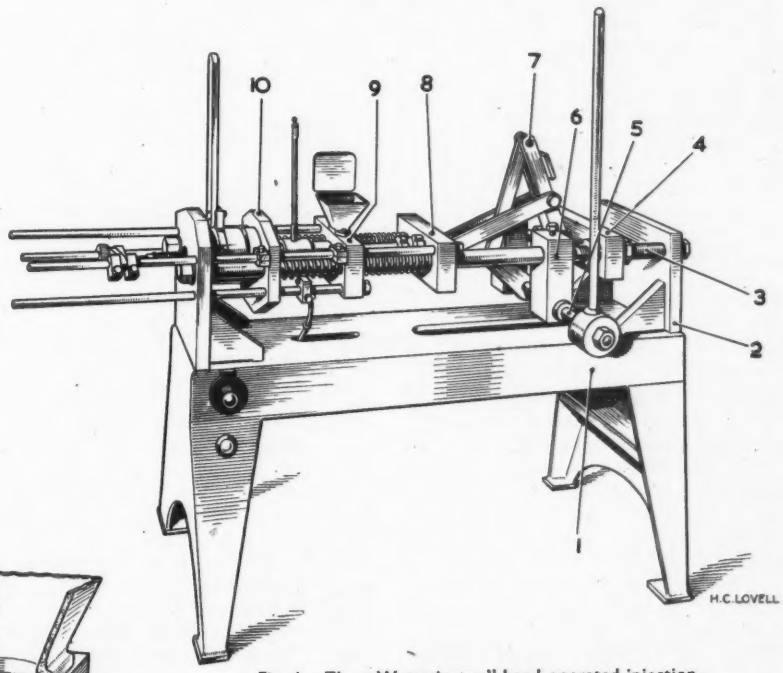


Fig. 1.—The "Westminster" hand-operated injection-moulding machine.

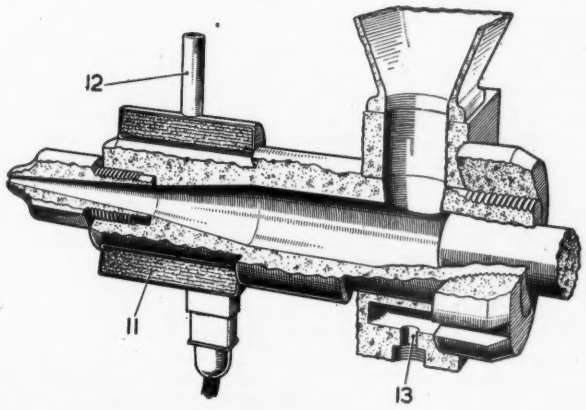


Fig. 2.—Material cylinder assembly.

1.—Machine base. 2.—Main support brackets. 3.—Parallel tie bars. 4.—Anchor plate. 5.—Actuating shaft. 6.—Adjustable bearings. 7.—Toggle mechanism. 8.—Injection-plunger crosshead. 9.—Material-cylinder crosshead. 10.—Movable platen. 11.—Electrical heating element in lagged case. 12.—Thermometer pocket. 13.—Water-cooled jacket for cylinder crosshead. 14.—Guide pins. 15.—Angular slot in guide pins. 16.—Angular cams. 17.—Locking ring. 18.—Hand lever. 19.—Ejector assembly.

The design of the cylinder is unique in that the forward half (in which the material is actually heated) and the nozzle together form a cone, so that the section of material is progressively reduced toward the nozzle outlet, ensuring rapid and complete plasticizing of the outgoing charge of material. This principle is the most efficient for this small-capacity cylinder and eliminates the use of a spreader, which has been found

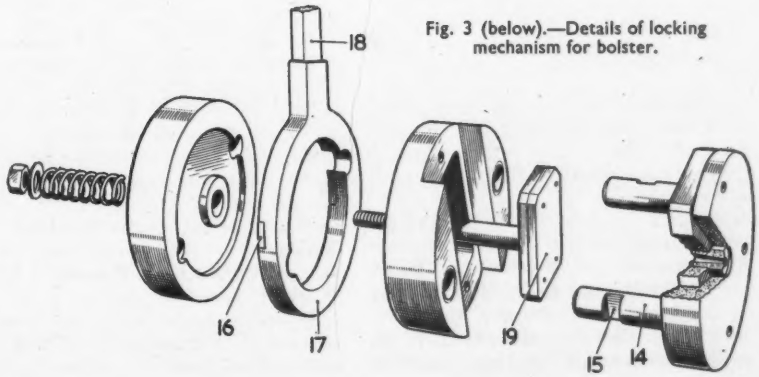


Fig. 3 (below).—Details of locking mechanism for bolster.

to offer too great a resistance to movement of material in the cylinder to be suitable for hand-powered injection.

The material cylinder is provided with an external band-type electrical-heating element of 500 watts capacity, which is enclosed in an asbestos-lined lagging case (11) incorporating a thermometer pocket (12). Temperature of the cylinder is accurately controlled by a "Sunvic" energy input regulator through a hot-wire vacuum switch relay.

The injection plunger, and also the charging end of the material cylinder, may be cooled by the circulation of water through a jacket incorporated in the cylinder crosshead (13) with inlet and outlet connections.

The hand-locking bolster is designed specially for the machine and accommodates a pair of rectangular mould blanks. The locking mechanism consists of two high-tensile heat-treated guide pins (14), each having an angular slot (15) and fixed into one-half of the bolster. When the mould is closed these guide pins enter locating holes in the other half of the bolster and engage into angular cams (16) formed by hardened pads inserted into a locking ring (17) containing a hand lever (18).

Movement of the lever causes the angular cams to engage into the slots of the guide pins, securely locking the mould faces together and pre-load the guide pins against the injection pressure. Reverse movement of the lever disengages the pins and the cams in the lock ring, leaving the guide pins free to be withdrawn from their locating holes when the mould is opened by the mechanical movement of the machine. The bolster also incorporates an ejector cavity, which houses an ejector-plate assembly (19).

Forward movement of the hand-lever carries the moving platen along the tie bars and closes the mould. The mould faces are then locked together by the lever incorporated in the bolster. Further movement brings the material cylinder up to the back of the mould, the nozzle registers in the radius of the sprue bush and the plunger forces the plasticized material into the mould cavity.

Reverse movement of the operating lever returns the injection plunger ready for the next charge of material, disengages the nozzle from the back of the mould (the mould is unlocked by reversing movement of the mould-lock lever) the mould then opens and ejector mechanism comes into operation, removing the moulding from the mould cavity.

LETTERS TO THE EDITOR

Plastics Supplies

SIR,—We have followed the correspondence which has been published in recent issues of "Plastics" in connection with moulding material shortages and should like to associate ourselves with what Mr. Harvey expressed in his letter published in your April issue.

We know that the manufacturers of moulding materials have been greatly disturbed to find their products appearing on the market in second or third hands at prices which can be described only as fantastic.

We cannot police every sale we make and we admit the possibility that, however careful a manufacturer may be in his distribution of a scarce product, some of it may find its way into the free market. So long as moulders are willing to pay the black market prices, they will continue to be exploited.

Erinoid, Ltd, have done a useful thing for the whole industry in issuing the circular which was reproduced in your journal, and we hope moulders up and down the country will support their effort to prevent scarce materials falling into the wrong hands.

MONSANTO CHEMICALS, LTD.,
J. W. Urban, Sales Controller.
Victoria Station House,
London, S.W.1.

Measurement of Plastic-covered Wire

SIR,—We note on page 150 in the May issue of "Plastics" a report on the continuous measurement of plastic-covered wire.

We wish to draw your attention to Brit. Pat. No. 642,903 held by our associate company, Shardlow Electric Wires, Ltd., where it is shown that the difficulty of continuous measurement of plastic-covered wire has long since been solved, and, in fact, a unit for this purpose is on the market and manufactured by Larmuth (1947), Ltd., Endsley Works, East Lancashire Road, Swinton, Manchester, in conjunction with ourselves.

The measurement, however, is not electronic; it is purely electro-magnetic and mechanical, but the same result is obtained and the speed of extrusion is controlled automatically by the haul-off gear. A considerable number of units are in operation and they are used completely through our own factories, with the result that the correct measurement of p.v.c. extruded wire is obtainable.

AERIALITE, LTD.
Castle Works,
Stalybridge, Cheshire.

Polythene Gloves

Sir,—We would be glad to know if polythene gloves are being manufactured for use in acid works and the like?

London. A.B. Co.

[EDITOR'S NOTE: We believe not, and, indeed, are dubious about the characteristics of such a glove. Theoretically, spraying would produce a coating on a fabric liner, but in view of the very low "wetting" powers of the polythene, impregnation, we feel, would be negligible; and the polythene coating might thus be merely a "loose glove" separated from the liner. Furthermore, a truly continuous homogeneous coating would be difficult to produce by a process other than dipping which in the case of a polythene would be difficult.]

Flooring Material

Sir,—We should be glad if you can tell us the name and address of the manufacturers of "Armorcord," a plastic material which can be used like linoleum.

E. S. AND A. ROBINSON, LTD.
Bristol, 1.

[EDITOR'S NOTE: "Armocord" is manufactured by Armoride, Ltd., Grove Mill, Earby, Colne, Lancs.]

Etching on Plastic

SIR,—We understand from an American source that etching similar to that carried out on metals with acids can also be performed on plastics of the thermoplastic type. Can you supply us with information regarding the type of materials used?

Manchester. S.T.S., LTD.

[EDITOR'S NOTE: Etching is not a suitable process. It would necessitate the use of solvents, e.g., benzol, acetones, esters, etc., and the use of masks. Results would be slow and sharply defined lines quite impracticable. The only methods available are moulding or grinding and cutting with fine tools. Obviously the photo-engraving industry examined the possibility long ago and noted its unsuitability.]

"Perspex" Tubes

SIR,—We shall be extremely pleased if you will kindly furnish us with the name of a manufacturer of "Perspex" tubes. We require this tubing in connection with the installation of water closets in light-alloy hulls when the normal metal piping would be unsuitable.

BLAKE AND SONS (GOSPORT), LTD.
80-82 South Street,
Gosport.

Covers for Photo Albums

Sir,—We are considering the production of a folio of photographs of models wearing spectacles, to be distributed throughout our branches. As these will undergo a great deal of handling it was thought that clear plastic would be the ideal material for the cover.

We have in mind the possible lamination between clear colourless plastic, of a design printed on some surface other than plastic.

DOLLOND AND AITCHISON, LTD.
192, Tottenham Court Road, W.1.

Successful Designing for Plastics Moulding—XXI

By W. M. HALLIDAY

In this instalment the author deals with the location and dimensions of lettering, and with holes, slots and other openings. The formation of holes in the walls of a moulding, by means of metallic core plugs embodied in the mould mechanism, afford the component designer great facilities in adapting the product for minimum overall cost.

CIRCUMSTANCES often render it necessary or most convenient to mould-in lettering, numbering, and designed inscriptions upon some surface of a moulded component. The ability to accomplish this simply and inexpensively does, indeed, constitute one of the chief advantages inherent in moulding processes. Such lettering, etc., may be moulded directly upon some external or internal surface, and is often the means whereby both the appearance and utility of the article may be improved.

The designer will generally be able to employ moulded inscriptions, lettering, and like features, to great advantage for the following reasons:—

(a) Lettering may be used successfully to interrupt or "break" large, flat and otherwise plain surfaces which lack interest and light-reflecting properties.

(b) Lettering or numbering will provide a useful means for identification of a component, or to provide the user with essential information respecting name and address of manufacturer, patent numbers, and working instructions.

(c) Lettering, etc., may often be adopted to mask minor defects occurring on large, flat surface areas, in cases where ribs, beadings, or matting cannot conveniently be employed.

(d) Lettering may be advantageously embodied into the general decorative styling of a component design to impart improved appearance finish.

(e) Lettering is often used as a means for ensuring that the finished moulding will adhere to one particular mould block, thereby simplifying the ejection of the finished component; also to simplify the operation of the mould.

Two forms of lettering may be employed in connection with a moulding, i.e., raised letters and sunken letters. From the aspect of mould manufacture, and in particular the reproduction of the cavity formations for such inscribed lettering, the raised form will be preferable. To produce sunken lettering will entail cutting back the major portion of the mould surface. This, obviously, will involve very extensive machining, often of a most tedious and intricate character, and therefore increase the costs of tool manufacture. If raised letters can be employed on the moulding, the necessary figuring can be engraved or stamped into the mould cavity surfaces in a very simple manner since depressed impressions therein will suffice.

The only exception to the above is in the case of mould cavities, which can be reproduced by the "hobbing" method. In this case the necessary inscriptions would be sunken into the surface of the master "hob," being duplicated in raised form on the mould cavity surfaces after the hob has pressed therein.

Location of Lettering

The surfaces upon which lettering is to be located should be carefully selected at the initial mould designing stages in order that the tool design may be of the simplest character and that ejection difficulties can be avoided. For example, lettering should always be situated upon a surface to lie perpendicular to the normal direction of the opening movement required in the mould, that is, upon a surface parallel with the main parting-line plane of the mould blocks.

If lettering is situated upon a side wall, or undercut portion of a moulded component, slide or split-blocks may be required to mould the same effectively and to allow the finished article to be extracted from the cavity formations. This requirement will often add greatly to the complexity of the mould construction, the final cost of the mould and the cost of the mouldings themselves by reason of the slowing down of the operating cycle.

In the case of lettering to be moulded upon some inside surface in the component, this should preferably be determined so as to lie on the end-face of some core plug, and not along the sides of such a mould element.

For preference, lettering should be situated upon some flat or only slightly domed surface of the component, because this will simplify the task of reproducing the reverse forms in the wall of the mould cavity. To produce lettering, etc., on a greatly curved surface will often entail an elaborate set-up on the engraving machine.

If lettering can be situated upon a shaped panel and bounded by a slightly raised beading the appearance of the component surface will often be greatly improved

Lettered inscriptions should never be located immediately adjacent to a normal flash line occurring on the component, as the subsequent trimming operations may entail damage being caused to the raised letters at that edge.

Dimensions of Lettering

To some extent the size of lettering to be employed will depend upon the magnitude of the surface area on which it is to be located, and the purpose for which it is required. In general, the height of projection of such lettering above the normal surface of the component should be maintained about .010 to .015 in. Formed letters to these dimensions will possess good decorative and light-reflecting values for effectively improving the appearance of flat surfaces. In the case of very large lettering the height dimension may be increased up to about .050 in.

The side flanks of each letter should be slightly inclined, i.e., from 1 to 2½ degrees taper so as to ensure that the width at the crest of the figure will be narrower than that at the root where it joins with the component wall. This will ensure freedom from sticking or dragging when the mould is opened and the component ejected out of the cavity. The sides of all letters should also be blended to the surface of the part with suitable small-radius fillets, these features still further improving appearance apart from adding to the strength of the lettered portion.

When an extensive amount of lettering is required, for example, in the case of a set of operating instructions, the mould cavity inscriptions may be formed most economically by the photographic etching process, working from an ordinary drawing lay-out of the inscribed letters. The mould cavity would be treated in this manner to produce very slightly sunken impressions, thus allowing raised letters to be produced on the surface of the component. The height of projection of letters formed in this way will, of course, be minute, yet generally will have clear-cut incision and pleasing appearance, whilst the cost of reproduction will be much less than that appertaining to any machining or hobbing process in view of the large amount of stock to be removed or displaced by these latter methods.

It is also worth while bearing in mind that lettering panels may sometimes be found of considerable assistance to the mould designer as a means for strengthening the slender walls of a component. By introducing a lettered inscription on the internal or external surfaces at such points the strength of the part will be improved, and the need for ribs, beadings, etc., will be eliminated.

"Coring"

Throughout earlier published instalments in this series a considerable amount of attention has been devoted to describe numerous important and, indeed, essential design principles and features which may be employed with greatest advantage with either a compression- or an injection-moulded article.

Many illustrations have been given showing preferred design forms to be selected, covering such points as wall thickness, surface formations, strength, homogeneity, ribbing, beading, and fluting.

These features will generally be adopted either to improve the strength and rigidity of the moulding, or to enhance its surface appearance, or both. The incorporation of them will often ensure not only the most economical production methods and times, but a most satisfactory kind of finished product.

One very important aspect of component and mould design thus far has only been briefly mentioned, and still remains for detailed consideration. The remaining sections of this series will therefore be given to a close study of those design problems relating to the formation of holes, slots, openings, recesses, interior configurations, etc., which may be required in a moulded component, and the ability to reproduce these features economically by the incorporation of inflexible, durable, metallic-core plugs installed directly into the mould construction.

Practically every type of moulded component will require holes, openings, or hollowing-out internally in some particular manner to economize on the weight of material entailed; to simplify later machining and assembly operations; or to permit the article to be moulded on more attractive or utilitarian lines.

The ability to "core" holes in the walls of a moulding constitutes one of the chief advantageous features inherent in the moulding processes. Very often great ingenuity will be expended by the component and mould designer in fashioning of holes and core plugs in the mould construction, so that holes may be economically and accurately formed at some point in the walls of the article.

Objects and Advantages of "Coring"

The innumerable practical advantages to be derived by the application of cored holes in the component configuration, and similarly by a judicious location of the requisite core plugs in the mould, should be clearly understood by the product designer. They will generally fall under the following headings:—

(1) By means of suitably "cored" holes considerable savings in weight of material in the finished product may be obtained, thereby reducing the cost of the component.

Heavily massed sections, or unduly thick walls, etc., may be eliminated by coring hollows and recesses into same, in a very simple manner, thereby reducing total weight of powder material required to form the part. The adoption of "cored" holes after this fashion may also give the added advantage of greatly simplifying the actual moulding of the article, usually with very little extra cost being involved in the manufacture of the moulding tool.

(2) Such weight reduction by coring can often be attained without in any way diminishing the strength, durability, or rigidity of the component walls. Sometimes the mechanical strength may be increased, especially if such "cored" hollows and holes, or the immediately surrounding walls, are buttressed by ribs, beads and fillets, after the fashion already illustrated and described.

(3) Holes, openings, recesses and like hollow formations can be reproduced with extreme rapidity by coring in situ in the mould; this is usually far quicker and less expensive than by any of the more conventional machining processes, such as milling, drilling, slotting, sawing, etc. Valuable economies on such subsequent machining operations may thus be achieved to reduce still further the overall production costs of the article.

(4) Closely associated with the last advantage is the additional point that, with a completely "cored" article, any subsequent machining may be wholly eliminated, or at least simplified to such a degree that worthwhile savings will accrue and the quality of the finished article promoted.

In practice this means that the numerous setting - up and handling requirements, such as transporting from machine to machine, and mounting the components in jigs and fixtures, etc., and generally preparing the articles for milling, drilling and like operations, will be obviated to a material extent. Likewise expensive cutting and forming tools, holding, locating and clamping fixtures, will be rendered unnecessary, and on this account alone intelligent coring of a component will often show profitable savings on overall costs.

(5) Allied also to the last advantage is the fact that a properly "cored" article, by reducing the later handling and machining requirements, will be less liable to suffer damage or errors.

Very frequently excellently moulded articles are rendered unsuitable for use due to defective machining, or holding facilities, which lead in turn to dimensional errors, surface defects, or undue weakening of the component.

(6) Holes and openings can be readily "cored" within precision limits of size and location in relation to other critical portions of the component.

This will apply particularly to those articles of an industrial or engineering type where strict uniformity of shape, dimensional accuracy, and precision location of holes are of primary importance. It also sometimes happens that with such a type of component some critical hole has to be formed to the closest dimensional accuracy, with tolerances of variation too fine to be economically achieved solely by moulding. Such holes may, however, be "cored" in the first place to the normal limits applicable to the particular moulding process selected, and thereafter lightly and simply machined to the final drawing sizes and tolerances. Thus, a simple and inexpensive reamering or drilling operation may be all that is required to complete such critical hole formations.

(7) By means of intelligently designed and properly disposed corings, wall sections may be kept to uniform thickness throughout the piece.

By avoiding uneven wall sections, and heavy massing of material at certain points, actual moulding of the part will be greatly simplified. For example, with a compression moulded component, where the length of cure is conditioned by the thickest wall section and the volume of material contained therein, by evening out wall thickness, cure time may often be appreciably reduced to give a quicker operating cycle, and similarly reduced costs of production.

(8) For the foregoing and allied reasons, sounder and more homogeneous mouldings will be produced; and numerous operating snags and difficulties will be completely avoided, thereby reducing the number of defective and scrap components over any given production run.

A component having uniform wall sections will also permit the material to "flow" much more satisfactorily in the mould, and thus ensure a greater freedom from numerous common irregularities liable to cause unsightly and often serious surface defects in the finished part.

(9) Use of uniform wall sections promoted by judicious "coring" of holes and hollowed portions will also generally result in a faster operation of the mould, with both compression and injection moulding, providing always, of course, that properly convenient facilities are installed for the rapid extraction of core plugs, or stripping the component therefrom.

By the use of detachable, sliding, rotating or collapsible core plugs, all of which types are readily adaptable, the final ejection of the finished moulded article can often be facilitated to an economical degree.

(10) The use of cores in a mould will give the mould designer and engineer improved facilities for "venting" the tool, and the major cavity formations in particular, to permit free escape of air, gas, or fume, which otherwise would cause troubles by reason of becoming trapped on some remote or restricted locations of the cavity area.

(11) With a well-cored mould construction the engineer will find the core plugs a useful means for maintaining a good thermal balance and a stable working temperature of the tool, which again

will promote elimination of numerous operating snags and minor defects occurring with the finished component.

(12) The speedier and safer ejection of the finished product from the mould will also usually be promoted by the use of "cored" holes and core plugs in the tool.

For instance, with injection moulding, it will be essential to ensure that the moulding will adhere to the movable block when the mould is parted, so that the ejector rods, mounted in that member, may engage upon the sides of the component to push it off the cores.

The introduction of core plugs in the movable block of such moulds therefore constitutes one of the chief means employed for drawing the finished moulding out of the major cavity formations contained in the stationary mould block. Thus "sticking," "hanging" or "dragging" effects occurring on the component during the ejection movements can be eliminated or greatly minimized, thereby simplifying the whole ejection procedure in a manner which will make for a much quicker and trouble-free working cycle.

To a lesser extent, this will apply, too, to compression-type mouldings, where it will frequently be necessary to ensure the finished part will consistently rise with the movable top force to afford greater access and working freedom for the operator having to manipulate the component when extracting same from the core plug. This will be particularly important in the case of multiple-impression moulds employing fixed core plugs, as distinct from those tools equipped with detachable cores, which are, of course, removed from the force-block together with the moulding.

(13) Cored holes and openings may be reproduced from a single solid-steel core plug or pin, which member will normally have considerable durability, remaining reasonably constant in size, shape and location for the production of many thousands of accurate holes in successively formed components.

In order to promote such long working life for these important mould members, however, special attention must be given to their shape, size, length, to diameter ratio, and general location. These requirements will be explained in greater detail later.

(14) By means of core plugs, holes of extremely difficult or even very complex cross-sectional shapes can be formed with far greater ease than can be accomplished by using any ordinary machining method of manufacture.

Many hole shapes, having to be reproduced by a machining method, may be found well-nigh impossible or grossly uneconomical on account of the high tooling cost, or the extreme slowness of the operation, or the lack of accuracy and uniformity achievable. Holes having a cross-sectional shape of regular form, such as a square, triangular, hexagon or polygon, can be moulded by a core plug with considerable simplicity, usually to show appreciable savings over any machining process.

The really difficult and irregular shapes of holes, such as elliptical, long elongated narrow slots, D-shaped holes, or those having raised or sunken projections running laterally along their length, either for the full distance of the hole or for a part thereof, may all be moulded by core plugs in a perfectly straightforward manner. Similarly, holes may be cored having a number of different diameters, providing these can be arranged in a descending sequence of size to ensure the largest will lie at the parting-line joint of the mould.

In certain special cases it will be possible to form holes having shallow undercuts or recesses at some point in their length, for which purpose split-type core plugs will be employed, these being collapsed when the finished component with such composite core has been removed from the mould.

Further, whilst it will generally prove most convenient and least expensive to have cored holes located with their length axis disposed at right-angles or parallel with the main parting-line joint of the mould, holes can be formed at a variety of inclinations to that joint, by the introduction of a slide mounting, in order that a degree of retractability can be imparted to the core plug.

By employing core plugs externally threaded, holes having similar internal thread formations can be readily cored. With the formation of internal threads in a compression-moulded article, it will usually be necessary to employ detachable core plugs, which can be extracted from the mould together with the component formed thereon, and the threaded core plug will then be unscrewed from the component at a secondary operation.

This latter method of core plug mounting in a compression mould will prove particularly beneficial in so far as operation and production times are concerned, because ejection requirements will be very much simplified, and many delays will be obviated. It is customary, also, to fashion a number of such threaded detachable core plugs, so that at least one complete spare set is available, which set would be used whilst the other set was being extracted from the mouldings formed at the preceding lift from the mould.

(15) The appearance and surface finish of a moulded component may often be enhanced by judicious coring of holes and internal formations.

Other design factors and working conditions being equal, this advantage will accrue by reason of the more uniform wall sections obtained, shorter curing time, more stable heat conditions of mould, shorter ejection cycle, and better flow of material in the mould cavity.

(16) The strength and rigidity of the finished component may be considerably increased with an article which is well cored, and having stiffening ribs, beadings, and fillets incorporated in the design, than would be the case with a non-cored article having very unequal wall sections.

(17) Assembly operations later to be performed on a moulded component can also often be advantageously simplified by the introduction of holes and openings passing through the walls of the part.

These are some of the chief practical advantages to be derived from adoption of intelligent "coring," and in most cases they will be feasible without adding materially to the initial cost of the moulding tool.

The component designer will be well advised always to bestow the closest consideration to the possibilities of coring holes, etc., and their mouldability, with any new projected component design, so that some of these advantages, if not all, may be derived. It will rarely be practicable to achieve all the above advantages in any single component design, because often circumstances may be such as will permit only one or two of these being utilized. In all such instances, the product designer will naturally be compelled to strike the best balance between permissible and non-permissible hole features to be adopted, striving always to embrace the largest number of advantages consistent with the service requirements to be fulfilled, the economical design and/or manufacture of the mould, and the simplest production at the moulding stage.

(To be continued)

British Standards

This year the British Standards movement attains its Golden Jubilee, and as a part of the celebrations an exhibition supported by practically the whole range of British industry will be held at the Science Museum, South Kensington, London, for two weeks beginning June 18.

The benefits derived from standards, standardization and simplification will be graphically presented, and each industry will show how standards have simplified production, reduced costs and maintained quality, and how they have benefited the users of that industry's products. It will also be shown how research at one end of the production chain and quality control at the other are linked with and helped by standardization. Other special features will include apparatus used in testing for compliance with British Standards.

Admission to the Exhibition will be free, and opening hours will be 10 a.m. to 7 p.m. each day, Sunday excepted, June 18 to 28 inclusive.

PATENT REVIEW

The following abstracts have been made from specifications at the Patent Office, with the permission of the Controller of H.M. Stationery Office. Complete specifications can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 2/- each.

B.P. 649,228. Appl. 5.11.48. Acc. 24.1.51.
Apparatus for cutting-off plastic extrusion moulded articles. E. C. Grace and D. Haley.

Apparatus for severing an extrusion moulded article from the extruding machine, consists of a frame carrying a wire which is traversed quickly at right angles to the direction of extrusion and permits cutting off without stopping the extrusion machine.

B.P. 649,249. Appl. 2.12.49. Acc. 24.1.51.
A continuous process and apparatus for compounding and mixing materials in the production of plastic moulding powder. S. A. Ede. To: James Ferguson and Sons, Ltd.

Automatic mixing and compounding plant for moulding powders and filler materials consisting of a series of rotating and vibrating mixing units which are interconnected by means of roller and belt conveyors. The mixed product is finally deposited in a drum on a weighing machine.

B.P. 649,252. Appl. 7.7.47. Acc. 24.1.51
Producing articles by seam-welding thermoplastic sheet or strip material. W. Schreuer. To: Communications Patents, Ltd.

Combined high frequency welding and cutting-off of thermoplastic materials. Knife-edge electrodes are used to heat, weld and sever the sheet material.

B.P. 649,326. Appl. 16.7.47. Conv. (U.S.A.) 30.8.46. Acc. 24.1.51.
Plasticisable elastomeric compositions. To: American Cyanamid Co.

Plasticiser for vulcanisable elastoprenes.

B.P. 649,336. Appl. 27.11.47. Acc. 24.1.51.
Laminated patterned plastic articles. G. C. L. Underwood.

Laminated structures composed of a number of opaque and transparent plastic sheets which are moulded together under pressure to form a pattern.

B.P. 649,356. Appl. 4.6.48. Conv. (U.S.A.) 21.11.47. Acc. 24.1.51.
Radio frequency bar sealer for seaming dielectric sheet material. To: Singer Manufacturing Co.

High frequency bar welder for plastics with a fixed lower electrode and a vertically movable top electrode. The movement is effected through a cam and motor-drive. Provision is made for power control and automatic timing.

B.P. 649,417. Appl. 12,10.48. Conv. (Italy) 27.10.47. Acc. 24.1.51.
Valves of curing bags as used in the curing of hollow articles, eg., tyre covers and articles composed of stratified material bonded with synthetic resin or the like. To: Pirelli S.P.A.

B.P. 649,474. Appl. 18.8.48. Conv. (U.S.A.) 25.8.47. Acc. 24.1.51.
Compositions comprising acrylonitrile polymers. To: American Viscose Corporation.

B.P. 649,539. Appl. 11.11.47. Conv. (U.S.A.) 5.12.46. Acc. 31.1.51.
Production of filaments of vinylidene chloride polymers and copolymers. G. A. Spencer. To: Firestone Tyre and Rubber Co.

B.P. 649,593. Appl. 25.3.48. Acc. 31.1.51.
Production of moulded or formed articles from plastic materials. To: British Mechanical Productions, Ltd.

Moulding of polytetrafluorethylene by heating a pellet to a temperature above 327 degrees C., placing the heated pellet in a mould at a temperature of 160 degrees to 200 degrees C. and moulding under a pressure of 1,000 lb./sq. in.

B.P. 649,603. Appl. 2.6.48. Acc. 31.1.51.
Manufacture of cellulose acetate. G. J. Cowe, H. Hampson, E. P. Sharman and J. P. Stoneman. To: Courtaulds, Ltd.

B.P. 649,609. Appl. 15.6.48. Conv. (U.S.A.) 5.7.47. Acc. 31.1.51.
Dispersions of vinyl chloride resins. R. W. Quarles and C. I. Spessard. To: Carbide and Carbon Chemicals Corporation.

B.P. 649,690. Appl. 13.10.48. Conv. (U.S.A.) 3.7.48. Acc. 31.1.51.
Electronic seaming machines. To: Singer Manufacturing Co.

Improvement of high frequency welding machine for plastics described in B.P. 603,412. Provision is made for controlling the penetration of the welding electrode into the plastic material by using an electronic thickness detector and automatically adjusting the position of the reciprocating top electrode accordingly.

B.P. 649,719. Appl. 29.8.47. Acc. 31.1.51.
Production of interpolymers and of moisture-proof sheet wrapping material coated therewith. W. Berry, J. Kay and R. A. Rose. To: British Cellophane, Ltd.

Interpolymers of vinylidene chloride and acrylonitrile as moisture-proofing compound.

B.P. 649,740. Appl. 6.7.48. Acc. 31.1.51.
Thermosetting aminoplastic moulding compositions. A. Brookes and J. Moore. To: British Industrial Plastics, Ltd.

Use of regenerated cellulose as filler for urea formaldehyde resin compositions.

B.P. 649,758. Appl. 21.12.48. Acc. 31.1.51.
Production of organo silicon polymers. To: Dow Corning Corp.

B.P. 649,763. Appl. 12.3.46. Conv. (France) 1.2.44. Acc. 31.1.51.
Container made of plastic material for lozenges, pills, tablets and the like. Charles Nicolle.

Special shape of flat container moulded from acetate sheet and permitting the dispensing of tablets one by one.

B.P. 649,853. Appl. 11.8.48. Acc. 7.2.51.
High-frequency welding apparatus. J. P. Pound. To: Pye, Ltd., and Tanks and Linings, Ltd.

Refers to welding jigs used in the manufacture of p.v.c. liners of cylindrical shape. One jig with a straight line electrode is provided for the welding of the longitudinal seams of the liner, another jig with a circular electrode for the welding of the circular end pieces to the shell of the liner.

B.P. 649,873. Appl. 14.9.48. Conv. (Italy) 1.2.46. Acc. 7.2.51.
Multiple extrusion dies for applying insulation to the cores of electric cables. Pirelli Societa per Azione. To: Pirelli General Cable Works.

Design of extrusion die for the extrusion of thermoplastic cable coverings. A mixing chamber with a number of annular outlets is provided for the thermoplastic material which flows into the direction of extrusion in a number of co-axial layers, joining on the wire to be covered.

B.P. 649,877. Appl. 22.9.48. Acc. 7.2.51.
Treatment of yarn comprising filaments of a synthetic linear polymer. G. H. L. Andrew. To: British Nylon Spinners, Ltd.

Treatment of synthetic yarns such as nylon with a solution of 2 per cent. sodium chloride in diethylene glycol to prevent the formation of electrostatic charges during the spinning or weaving process.

B.P. 649,955. Appl. 11.5.48. Conv. (U.S.A.) 1.8.47. Acc. 7.2.51.
Improvements in or relating to resinous compositions. W. G. Simons and E. H. Dafter Jr. To: American Cyanamide Co.

Refers to polymerization process for polyester and alkyd resins.

B.P. 649,987. Appl. 30.1.48. Conv. (U.S.A.) 26.3.47. Acc. 7.2.51.
Injection moulding apparatus. To: United States Rubber Co.

Injection moulding machine of the hydraulic pressure type is fitted with a plurality of moulds which are grouped concentrically to the injection cylinder. Passages from the central cylinder to each mould are opened and closed individually so that each mould can be filled independently.

B.P. 650,002. Appl. 21.3.48. Acc. 7.2.51.
Polyesters and method for their manufacture. S. F. Marrian. To: I.C.I., Ltd.

Refers to production of dibasic organic acid polyesters of a resinous character.

B.P. 650,036. Appl. 18.6.47. Acc. 14.2.51.
Manufacture of thermoplastic and thermosetting compositions from Zein. S. H. Pinner and A. D. Whitehead. To: B.X. Plastics, Ltd.

B.P. 650,072. Appl. 29.6.48. Acc. 14.2.51.
Method of producing micro-porous to coarsely porous objects from polyvinyl compounds. B. Nilssen.

B.P. 650,122. Appl. 14.5.48. Acc. 14.2.51.
Flexible liquid containers. W. Waldron and P. J. Schofield. To: I.C.I., Ltd.

Flexible oil or fuel containers for aircraft are made according to the invention from butadiene-acrylonitrile copolymer sheet material in conjunction with a fibrous reinforcement (sandwich construction).

B.P. 650,133. Appl. 13.7.48. Conv. (U.S.A.) 18.7.47. Acc. 14.2.51.
Phenol-modified acetone resins. To: Bakelite Corporation.

B.P. 650,149. Appl. 1.9.48. Acc. 14.2.51.
Production of cellulose acetate for use in moulding compositions. J. C. P. Boyes-Watson and G. B. Turner. To: Courtaulds, Ltd.

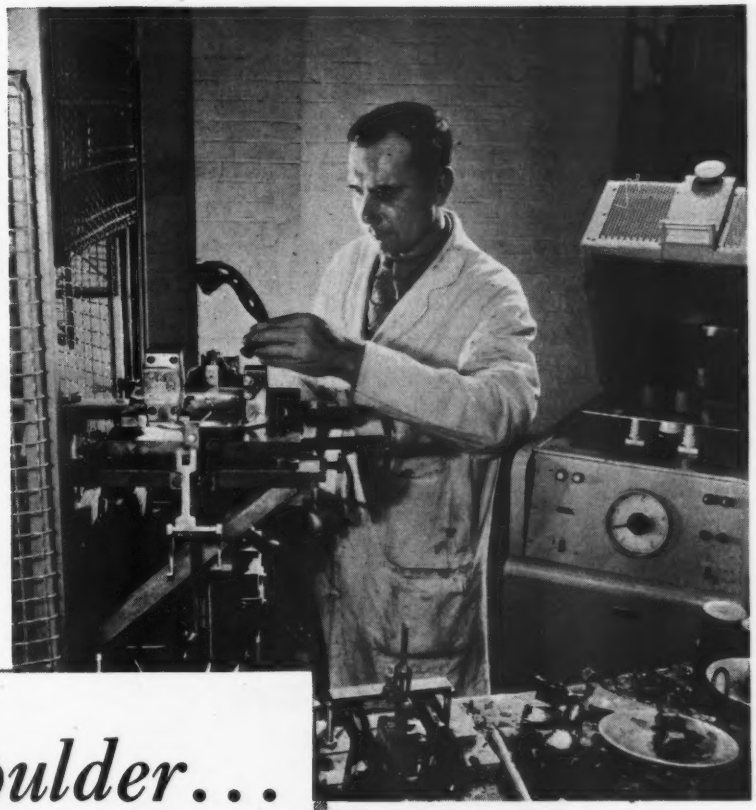
Cellulose acetate of improved thermal and colour stability for use in moulding compositions is manufactured according to the invention by treating the precipitated secondary cellulose acetate prior to drying with a salt of the following composition:—
$NaOOC.CH_2.C(OH)(COOH).CH_2.COOH$.

B.P. 650,163. Appl. 17.1.48. Acc. 14.2.51.
Apparatus for packaging articles. T. E. H. Gray and A. H. M. Hytch. To: Dunlop Rubber Co., Ltd.

Packaging of table tennis balls or the like in a close-fitting sheath of thermoplastic film. The thermoplastic film is cut into circular disc shapes and welded by high frequency on the circumference after inflating the discs in the mould and inserting the ball. When the inflation pressure is removed, the sheath fits closely to the ball.

B.P. 650,317. Appl. 19.11.47. Conv. (U.S.A.) 20.11.46. Acc. 21.2.51.
Improvements in moulding compositions. G. F. Metz. To: Shawinigan Products Corp.

Refers to binders for gramophone records based on polyvinyl acetal resins.



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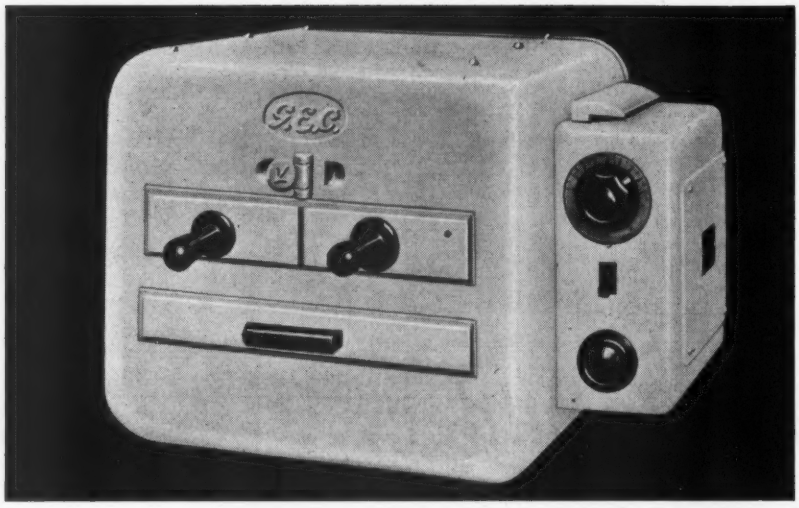

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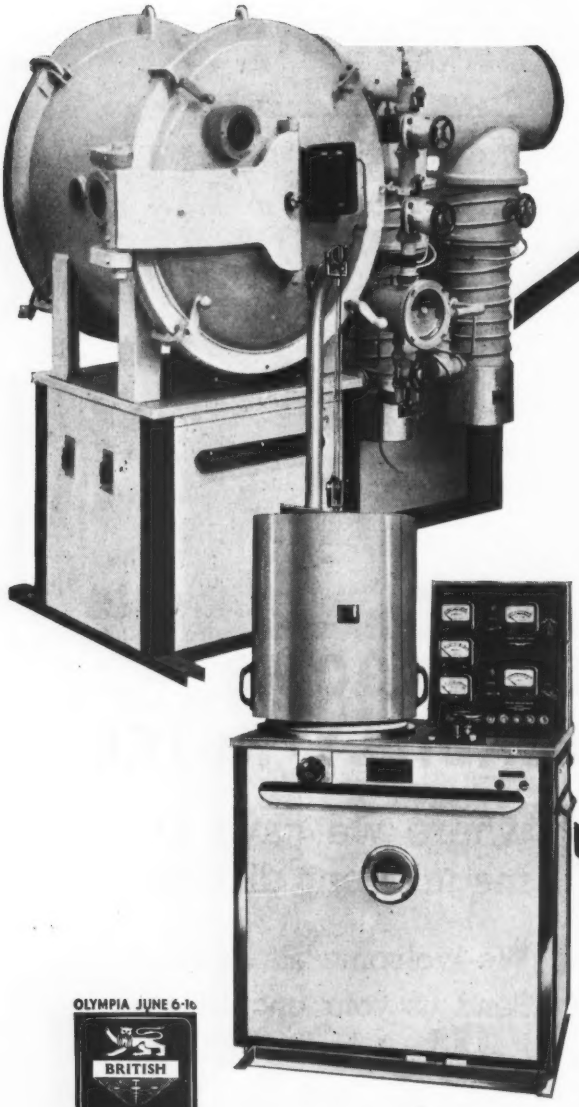

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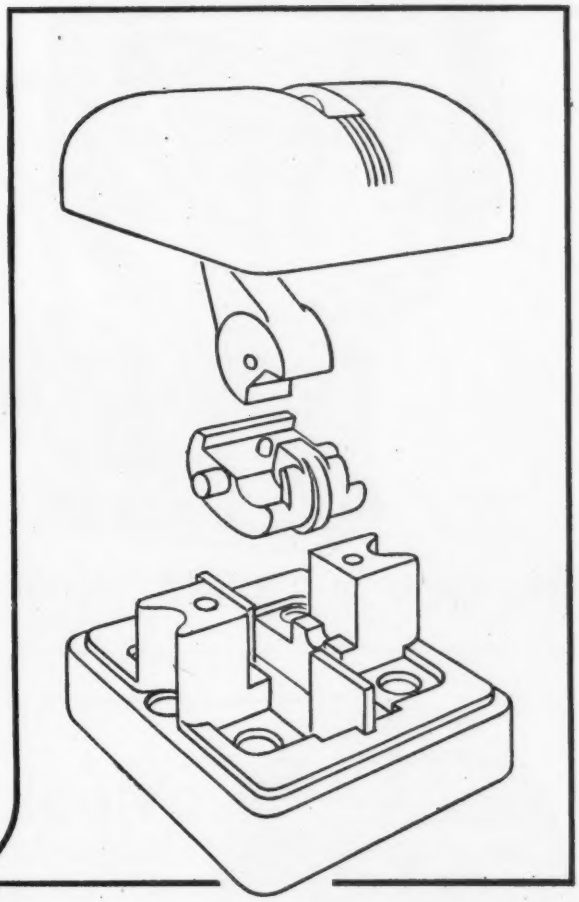

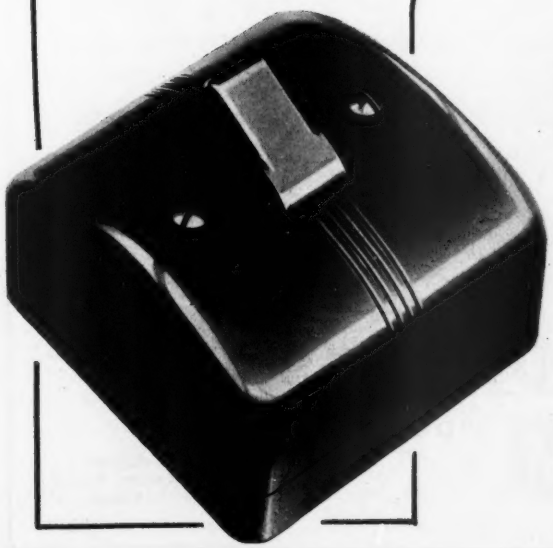

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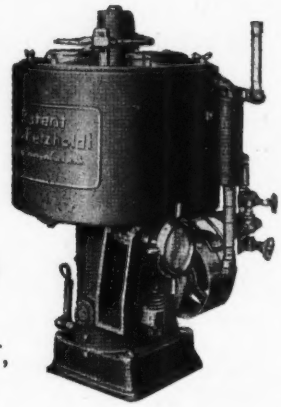

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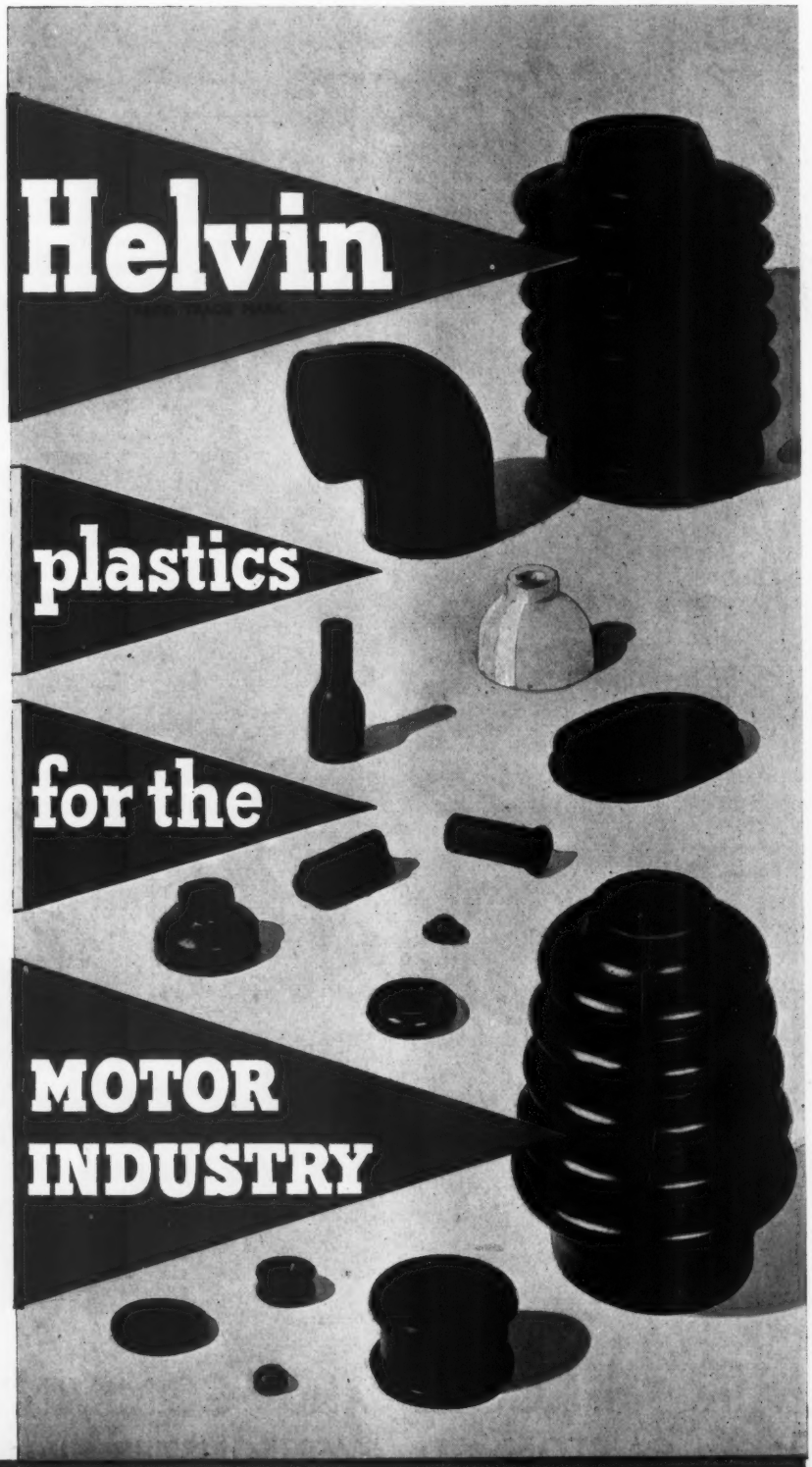

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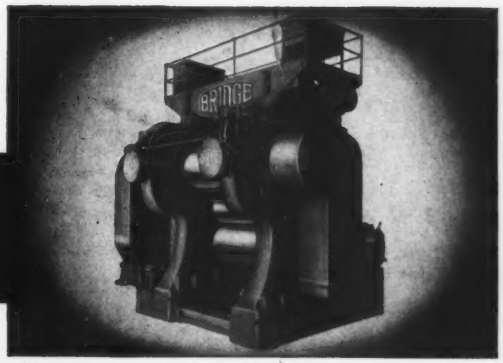

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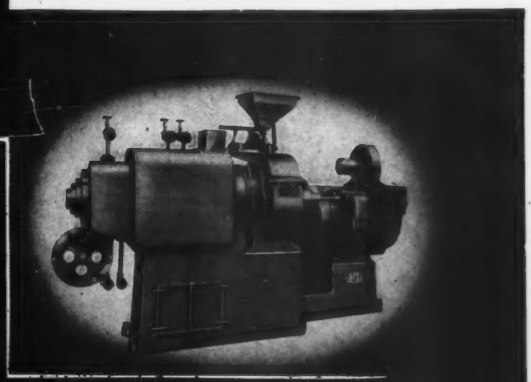

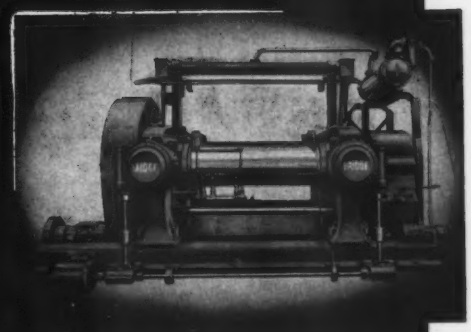

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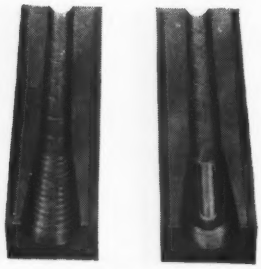

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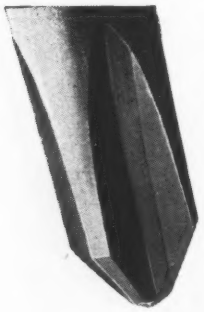

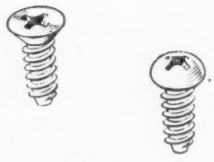

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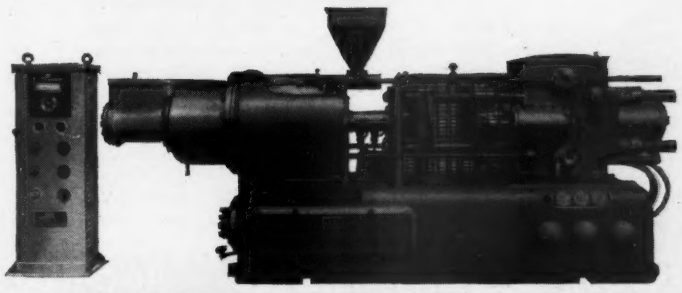

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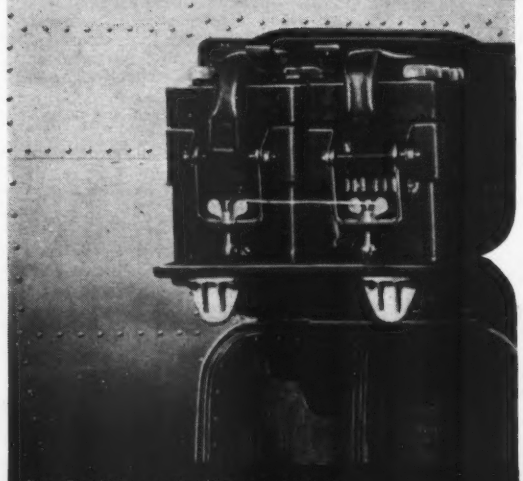

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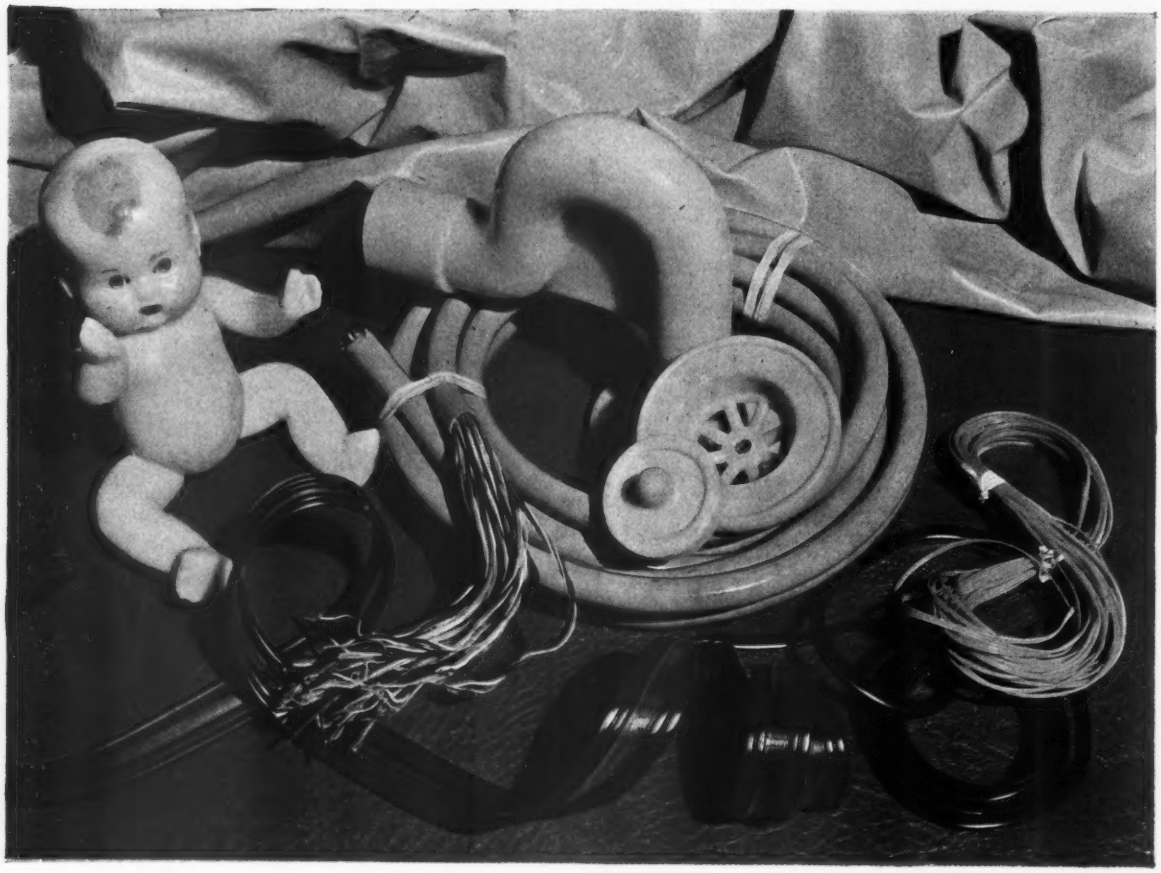

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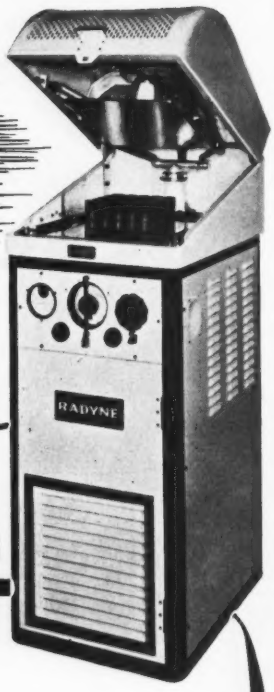

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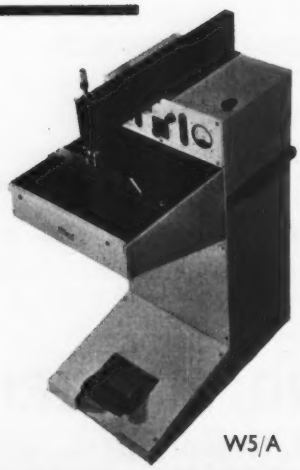

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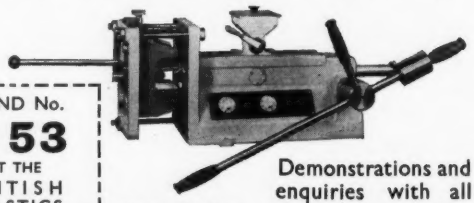

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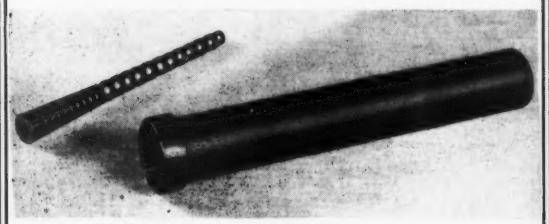

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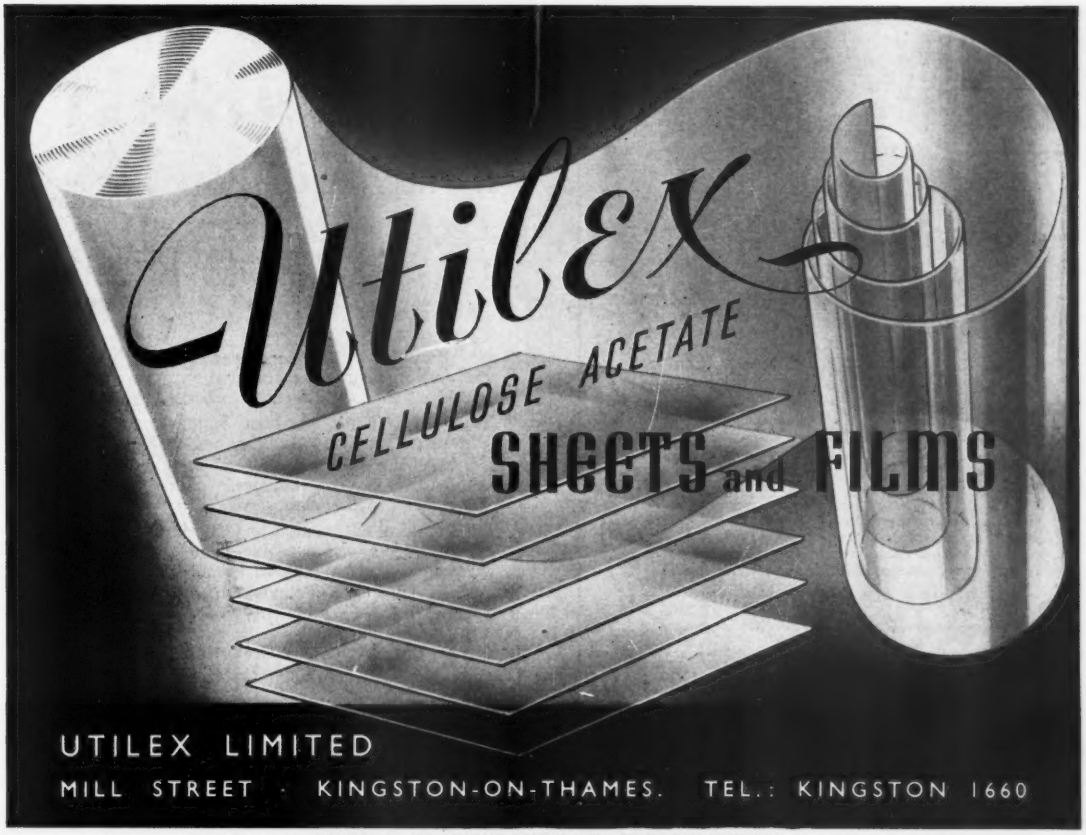
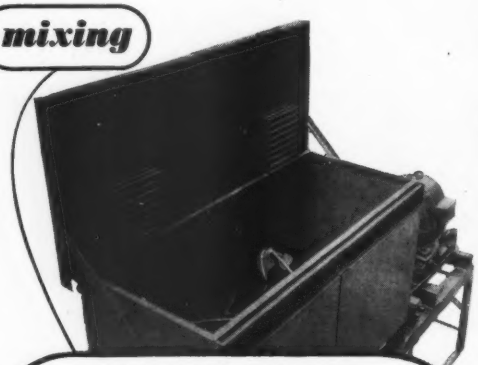


STAND No. A5 AT THE BRITISH PLASTICS EXHIBITION

mixing



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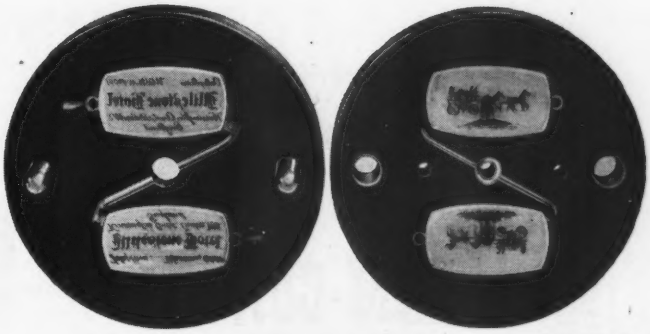

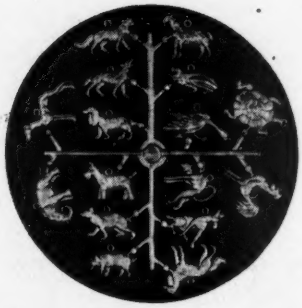

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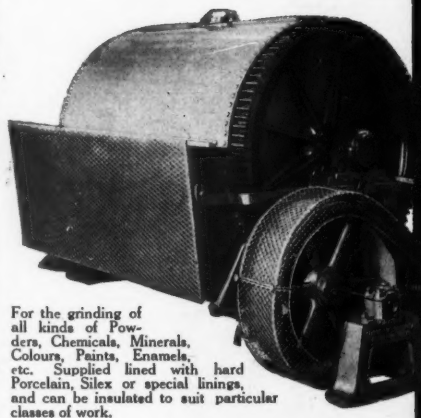

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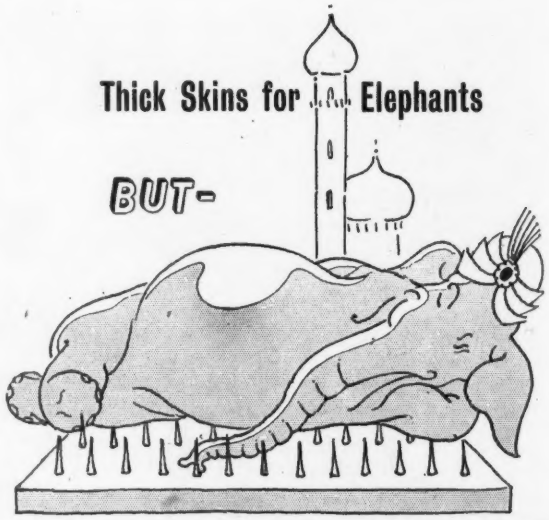

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Problems in designing the iron were great and Insulators Ltd. had the privilege of collaborating in the special moulding design of the handle and control knob. Inserts are moulded in and must be accurate for assembly purposes. Phenolic materials were used. Insulators Ltd. are proud to quote this as another instance of their moulding know-how and technique. A vast experience is at your disposal.

OLYMPIA JUNE 6-16

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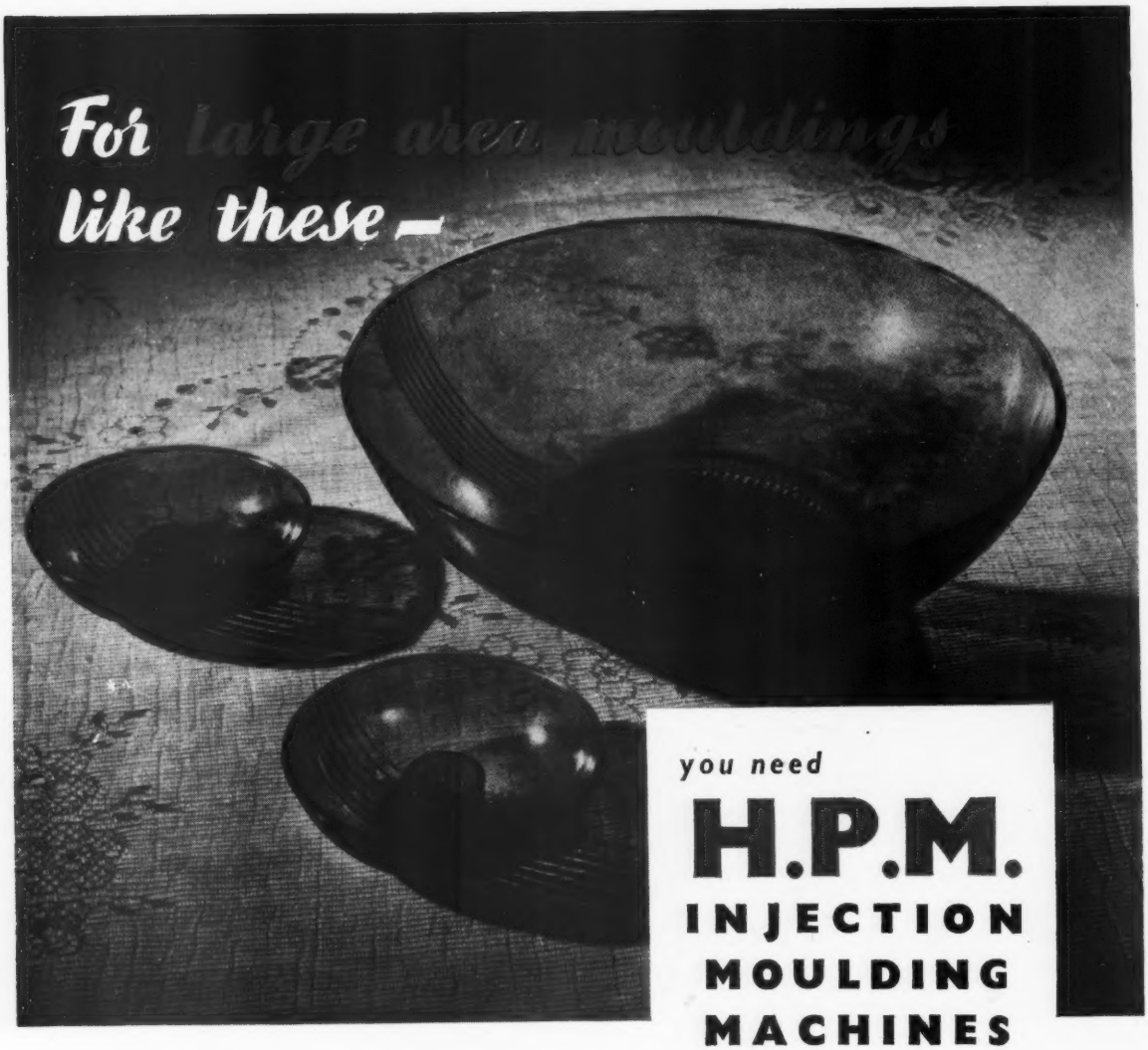

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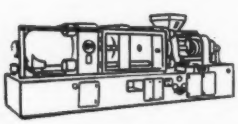
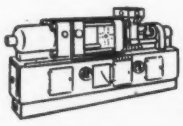
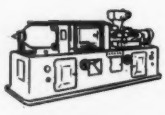
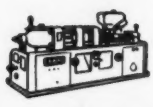

60 ounce


32 ounce


16 ounce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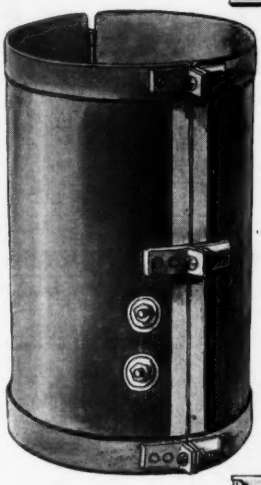

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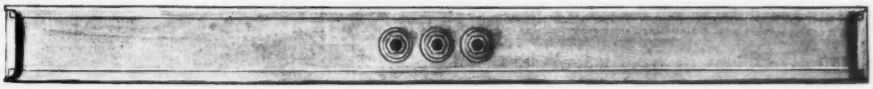

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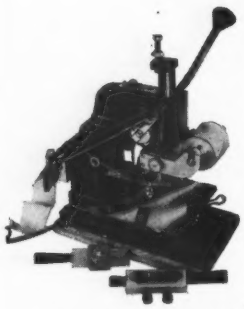

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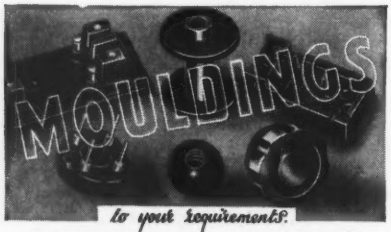

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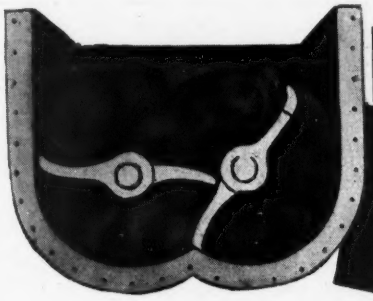

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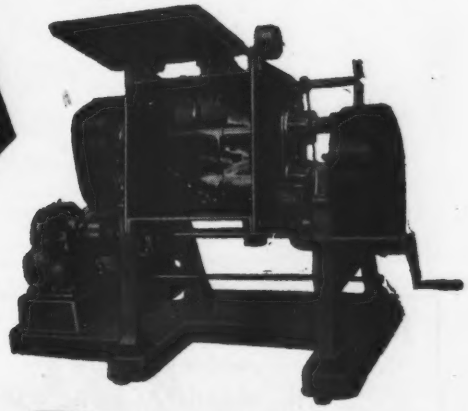

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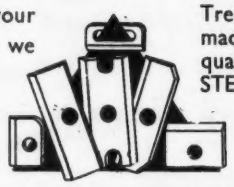

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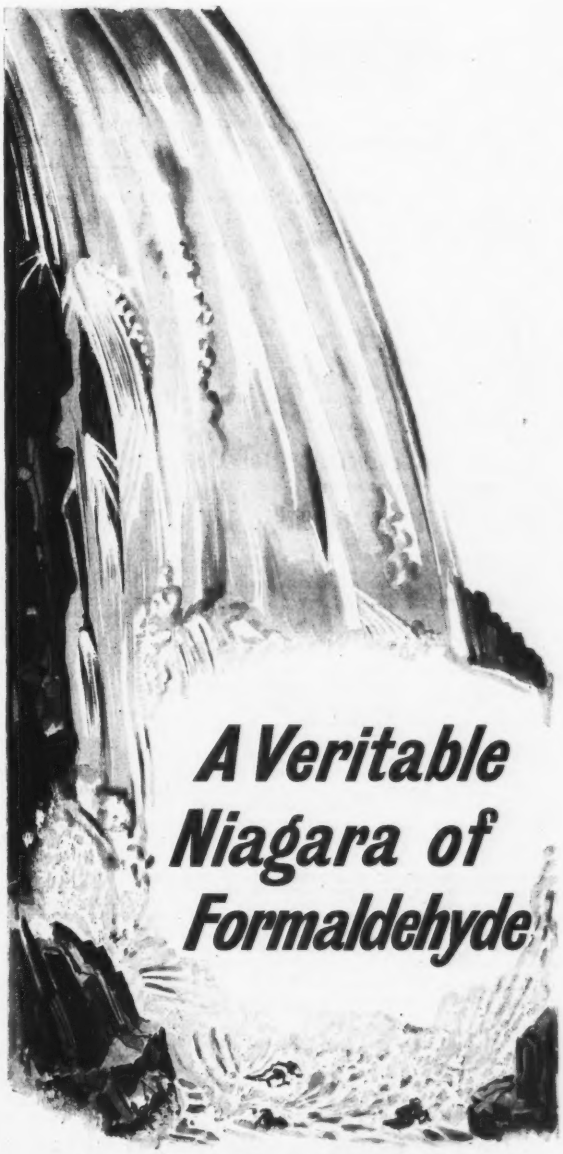

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PLASTICS TECHNOLOGIST required for important new development by company in South London area. Applicants should not be above 25. Minimum qualification Inter. B.Sc. Some knowledge of plastics essential. Salary according to age and experience. Particulars to Box P6512, care of "Plastics." 167-9

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Completed applications must be returned by June 28, 1951. 167-18

TOOL ROOM DRAUGHTSMAN, 21-25, for plastic mould design. Experience in injection, compression or pressure die casting an advantage but not essential. Reply stating salary required and experience to British Xylonite Co., Ltd., Cascelloid Division, Abbey Lane, Leicester. 167-4

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TECHNICAL SALESMAN REQUIRED, with chemical training, but not necessarily degree, to develop chemical technical agencies on the home market. Special experience in paint, synthetic resin manufacture, plastics, desirable. Write fully, Box P6711, care of "Plastics." 167-29

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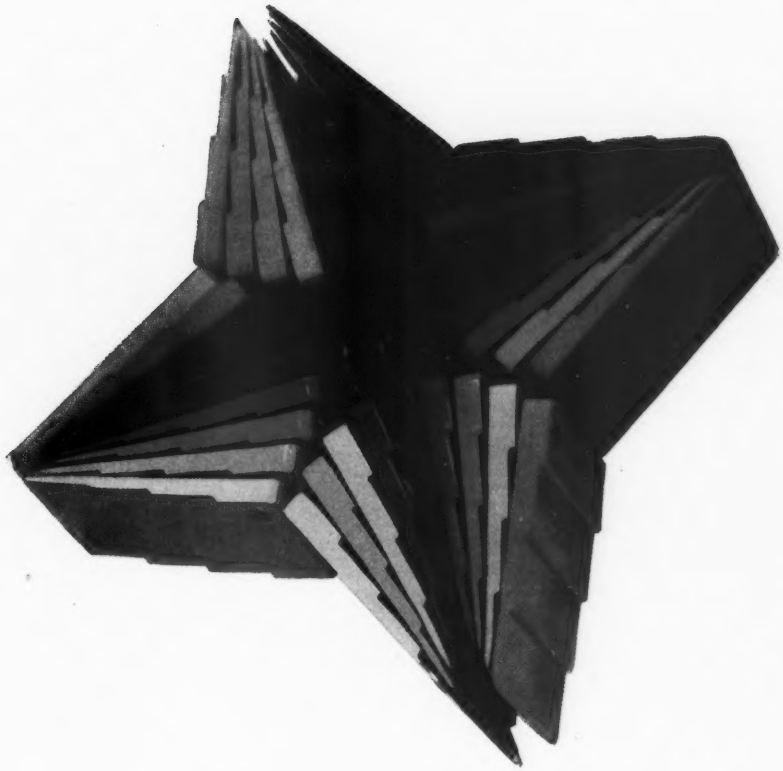

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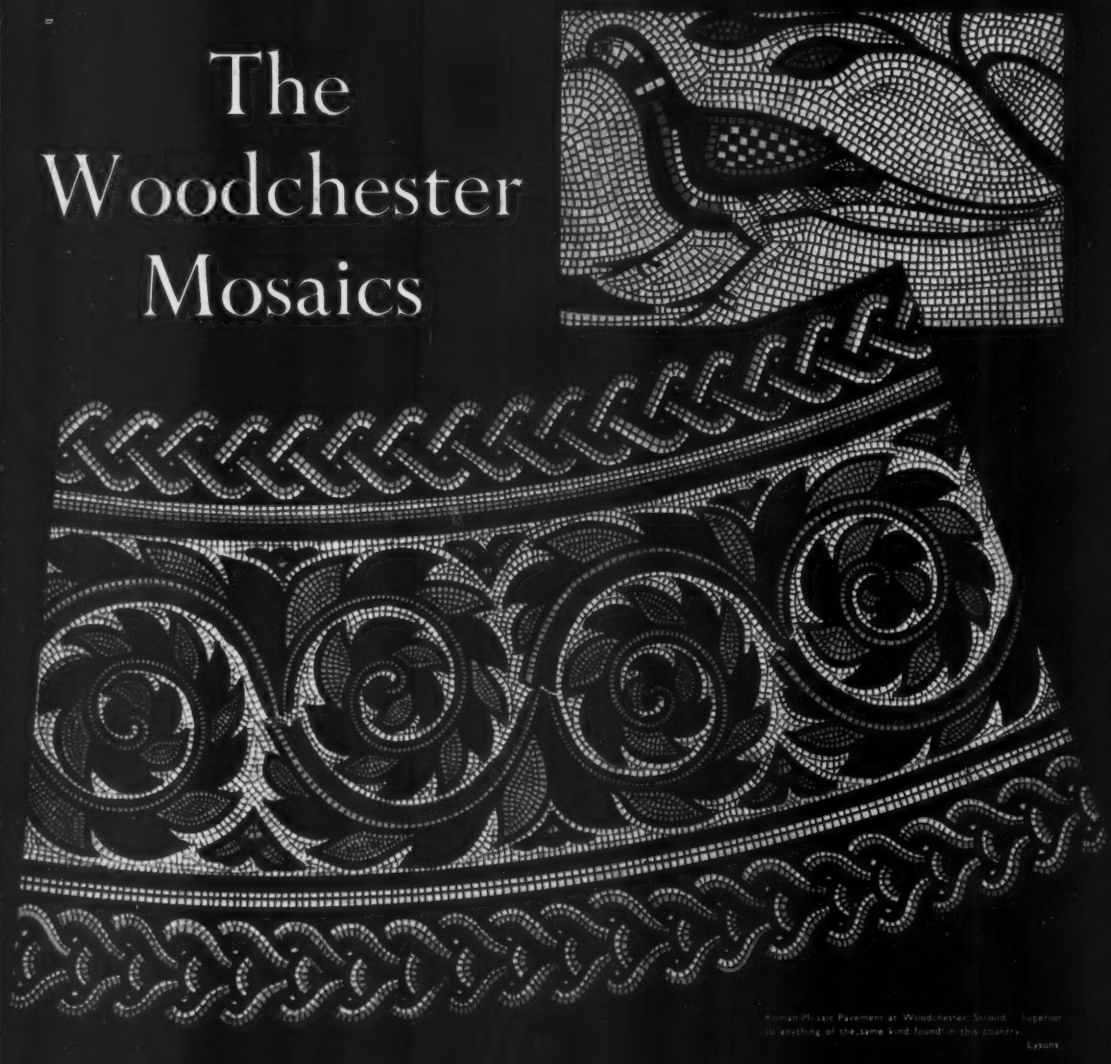

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